

创新大学英语

基础医学英语教程

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Unit 1

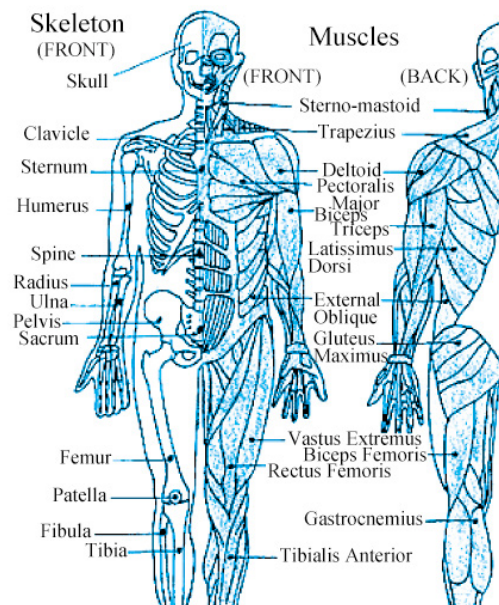
Passage A

Skeleton and Muscles



Pre-reading Activities

I. Look at the diagram below. Try to describe the bones in the human body.



II. Try to understand the following terms before your reading.

bone /bəʊn/ *n.* rigid organs that constitute part of the endoskeleton of vertebrates 骨，骨骼

skeleton /ˈskelɪtən/ *n.* the hard structure (bones and cartilages) that provides a frame for the body of an animal 骨骼，骨架

muscle /ˈmʌsl/ *n.* one of the contractile organs of the body 肌肉

joint /dʒɔɪnt/ *n.* the point of connection between two bones or elements of a skeleton 关节

tendon /ˈtendən/ *n.* a cord or band of inelastic tissue connecting a muscle with its bony attachment 腱

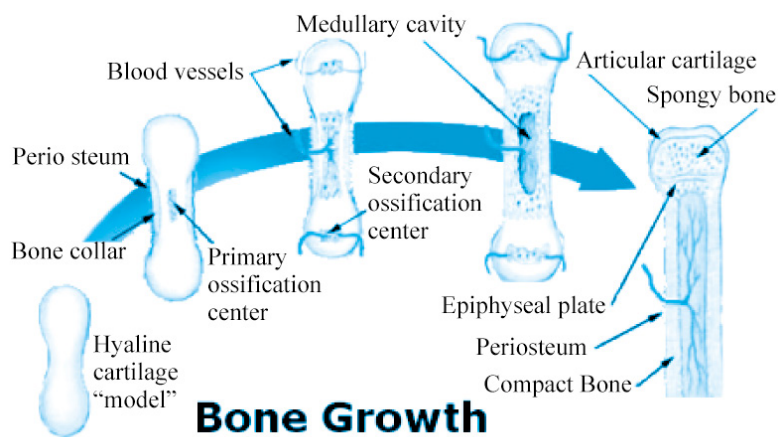
cartilage /ˈkɑːt(ɪ)lɪdʒ/ *n.* tough elastic tissue, mostly converted to bone in adults 软骨

ligament /ˈlɪɡəmənt/ *n.* a sheet or band of tough fibrous tissue connecting bones or cartilages or supporting muscles or organs 韧带

Text

Introduction

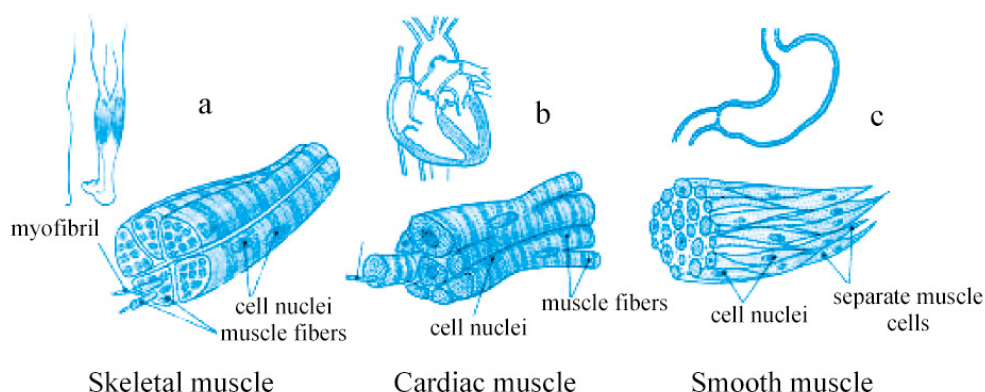
- ① From the head to the toes, bones provide support for bodies and help form the shape¹. The skull protects the brain and forms the shape of the face. The spinal cord, a pathway for messages between the brain and the body, is protected by the backbone, or spinal column. The ribs form a cage that shelters the heart, lungs, liver, and **spleen**, and the **pelvis** helps protect the bladder, **intestines**, and in women, the reproductive organs. Although they're very light, bones are strong enough to support the entire weight.
- ② Joints occur where two bones meet. They make the skeleton flexible — without them, movement would be impossible. Muscles are also necessary for movement. They're the masses of tough, **elastic** tissue that pull the bones when moving. Together, bones, muscles, and joints — along with tendons, ligaments, and cartilage — form **musculoskeletal** systems and enable human beings to do everyday physical activities.



Bones

- ③ The human skeleton has 206 bones. Bones begin to develop before birth. When the skeleton first forms, it is made of flexible cartilage, but within a few weeks it begins the process of **ossification**². Ossification is when the cartilage is replaced by hard deposits of calcium **phosphate** and stretchy **collagen**, the two main components of bone. It takes about 20 years for this process to be completed.
- ④ The bones of kids and young teens are smaller than those of adults and contain “growing zones” called growth plates. These plates consist of columns of multiplying cartilage cells that grow in length, and then change into hard, mineralized bone. These growth plates are easy to spot on an X-ray. Because girls mature at an earlier age than boys, their growth plates change into hard bone at an earlier age.
- ⑤ Bone building continues throughout one's life, as the body constantly renews and reshapes the bones' living tissue. Bone contains three types of cells: **osteoblasts**, which make new bone and help repair damage; **osteocytes**, which carry nutrients and waste products to and from blood vessels in the bone; and **osteoclasts**, which break down bone and help to sculpt and shape it. Osteoclasts are very active in kids and teens, working on bone as it is remodeled during growth. They also play an important role in the repair of fractures.

- 6 Bones are made up of calcium, **phosphorus**, **sodium**, and other minerals, as well as the protein collagen. Calcium is needed to make bones hard, which allows them to support your weight. Bones also store calcium and release some into the bloodstream when it's needed by other parts of the body. The amounts of certain vitamins and minerals that one eats, especially vitamin D and calcium, directly affect how much calcium is stored in the bones.



- 7 The soft bone **marrow** inside many of the bones is where most of the blood cells flowing through the bodies are made. The bone marrow contains special cells called stem cells, which produce the body's red blood cells and **platelets**. Red blood cells carry oxygen to the body's tissues, and platelets help with blood clotting when a person has a cut or wound.
- 8 Bones are made up of two types of material — compact bone and **cancellous** bone. Compact bone is the solid, hard, outside part of the bone. It looks like ivory and is extremely strong. Holes and channels run through it, carrying blood vessels and nerves from the **periosteum**, the bone's membrane covering, to its inner parts. Cancellous bone, which looks like a sponge, is inside the compact bone. It is made up of a mesh-like network of tiny pieces of bone called trabeculae. The spaces in this network are filled with red marrow, found mainly at the ends of bones, and yellow marrow, which is mostly fat.
- 9 Bones are fastened to other bones by long, fibrous straps called ligaments. Cartilage, a flexible, rubbery substance in joints, supports bones and protects them where they rub against each other.

Muscles

- 10 Bones don't work alone — they need help from the muscles and joints³. Muscles pull on the joints, allowing a person to move. They also help the body perform other functions so a person can grow and remain strong, such as chewing food and then moving it through the digestive system.
- 11 The human body has more than 650 muscles, which make up half of a person's body weight. They are connected to bones by tough, cord-like tissues called tendons, which allow the muscles to pull on bones. If a person wiggles the fingers, the person can see the tendons on the back of the hand move as they do their work.
- 12 Humans have three different kinds of muscle: Skeletal muscle is attached to bone, mostly in the legs, arms, abdomen, chest, neck, and face. Skeletal muscles are called striated muscles because they are made up of fibers that have horizontal stripes when viewed under a microscope. These muscles hold the skeleton together, give the body shape, and help it with everyday movements (they are known

as voluntary muscles because you can control their movement). They can contract (shorten or tighten) quickly and powerfully, but they tire easily and have to rest between workouts. Smooth, or involuntary, muscle is also made of fibers, but this type of muscle looks smooth, not striated. Generally, we can't consciously control our smooth muscles; rather, they're controlled by the nervous system automatically (which is why they are also called involuntary). Examples of smooth muscles are the walls of the stomach and intestines, which help break up food and move it through the digestive system. Smooth muscle is also found in the walls of blood vessels, where it squeezes the stream of blood flowing through the vessels to help maintain blood pressure. Smooth muscles take longer to contract than skeletal muscles do, but they can stay contracted for a long time because they don't tire easily. **Cardiac** muscle is found in the heart. The walls of the heart's chambers are composed almost entirely of muscle fibers. Cardiac muscle is also an involuntary type of muscle. Its rhythmic, powerful contractions force blood out of the heart as it beats.

- 13 Even when a person sits perfectly still, there are muscles throughout one's body that are constantly moving. Muscles enable the heart to beat, the chest to rise and fall as one breathes, and the blood vessels to help regulate the pressure and flow of blood through the body. When smiling and talking, muscles are helping us communicate, and when we're exercising, they help us stay physically fit and healthy.
- 14 The movements your muscles make are coordinated and controlled by the brain and nervous system. The involuntary muscles are controlled by structures deep within the brain and the upper part of the spinal cord called the brain stem. The voluntary muscles are regulated by the parts of the brain known as the **cerebral** motor **cortex** and the **cerebellum**.
- 15 When a person decides to move, the motor cortex sends an electrical signal through the spinal cord and **peripheral** nerves to the muscles, causing them to contract. The motor cortex on the right side of the brain controls the muscles on the left side of the body and vice versa.
- 16 The cerebellum coordinates the muscle movements ordered by the motor cortex. **Sensors** in the muscles and joints send messages back through peripheral nerves to tell the cerebellum and other parts of the brain where and how the arm or leg is moving and what position it's in. This feedback results in smooth, coordinated motion. If a person wants to lift his arm, the brain sends a message to the muscles in the arm and the person moves it. When running, the messages to the brain are more involved, because many muscles have to work in rhythm.
- 17 Muscles move body parts by contracting and then relaxing. Muscles can pull bones, but they can't push them back to the original position. So they work in pairs of **flexors** and **extensors**. The flexor contracts to bend a limb at a joint. Then, when having completed the movement, the flexor relaxes and the extensor contracts to extend or straighten the limb at the same joint. For example, the **biceps** muscle, in the front of the upper arm, is a flexor, and the **triceps**, at the back of the upper arm, is an extensor. When bending at the elbow, the biceps contracts. Then the biceps relaxes and the triceps contracts to straighten the elbow.



New Words and Phrases

spleen /spli:n/ <i>n.</i>	a large dark-red oval organ on the left side of the body between the stomach and the diaphragm which produces cells involved in immune responses 脾脏
pelvis /'pelvɪs/ <i>n.</i>	the structure of the vertebrate skeleton supporting the lower limbs in humans and the hind limbs or corresponding parts in other vertebrates 骨盆
intestine /ɪn'testɪn/ <i>n.</i>	the part of the alimentary canal between the stomach and the anus 肠
elastic /ɪ'læstɪk/ <i>a.</i>	capable of resuming original shape after stretching or compression; springy; able to adjust readily to different conditions 有弹性的, 能伸缩的
musculoskeletal /ˌmʌskjʊləʊ'skelɪt(ə)l/ <i>a.</i>	relating to muscles and skeleton 肌(与)骨骼的
ossification /ˌɒsɪfɪ'keɪʃən/ <i>n.</i>	the developmental process of bone formation, the calcification of soft tissue into a bonelike material 成骨, 骨化
phosphate /'fɒsfet/ <i>n.</i>	a salt of phosphoric acid 磷酸盐
collagen /'kɒlədʒən/ <i>n.</i>	the fibrous protein constituent of bone, cartilage, tendon, and other connective tissue 胶原蛋白
osteoblast /'ɒstriə(ʊ)blæst/ <i>n.</i>	a cell from which bone develops 成骨细胞
osteocyte /'ɒstriə(ʊ)sait/ <i>n.</i>	mature bone cell 骨细胞
osteoclast /'ɒstriə(ʊ)klæst/ <i>n.</i>	cell that functions in the breakdown and resorption of bone tissue 破骨细胞
phosphorus /'fɒsfərəs/ <i>n.</i>	a multivalent nonmetallic element of the nitrogen family that occurs commonly in inorganic phosphate rocks and as organic phosphates in all living cells 磷
sodium /'səʊdiəm/ <i>n.</i>	a silvery soft waxy metallic element of the alkali metal group which occurs abundantly in natural compounds (especially in salt water) 钠
marrow /'mæərəʊ/ <i>n.</i>	the fatty network of connective tissue that fills the cavities of bones 骨髓
platelet /'pleɪtlɪt/ <i>n.</i>	tiny bits of protoplasm found in vertebrate blood 血小板
cancellous /'kæns(ə)ləs/ <i>a.</i>	having an open or latticed or porous structure 网状骨质的
periosteum /ˌperi'ɒstriəm/ <i>n.</i>	a dense fibrous membrane covering the surface of bones 骨膜
cardiac /'kɑːdiæk/ <i>a.</i>	of or relating to the heart 心脏的, 贲门的
cerebral /'serɪbrəl/ <i>a.</i>	of or relating to the cerebrum or brain 脑的
cortex /'kɔːteks/ <i>n.</i>	the out layer of the cerebrum 皮质, 皮层
cerebellum /ˌserɪ'beləm/ <i>n.</i>	a major division of the vertebrate brain which situates above the medulla oblongata and beneath the cerebrum in human 小脑
peripheral /pə'rɪfərəl/ <i>a.</i>	on or near an edge or constituting an outer boundary, the outer area, related to the key issue but not of central importance 外围的; 周边的, 周围的
sensor /'sensə/ <i>n.</i>	any device that receives a signal or stimulus (as heat or pressure or light or motion, etc.) and responds to it in a distinctive manner 传感器

flexor /'fleksə/ <i>n.</i>	a skeletal muscle whose contraction bends a joint 屈肌
extensor /'ek'stensə/ <i>n.</i>	a skeletal muscle whose contraction extends or stretches a body part 伸肌
biceps /'baɪseps/ <i>n.</i>	any skeletal muscle having two origins (but especially the muscle that flexes the forearm) 双头肌
triceps /'traɪseps/ <i>n.</i>	any skeletal muscle having three origins (but especially the triceps brachii) 三头肌

► Word Building

Stems/Affixes	Meaning	Examples
muscul(o)-	muscle	musculoskeletal, muscularity, musculotendinous
phosph(o)-	phosphorus(P)	phosphate, phosphatase, phosphorylate
oste(o)-	bone	osteoblast, osteoarthritis, osteosarcoma
peri(o)-	around	periosteum, peripheral, pericardiocentesis
cere-	brain	cerebellum, cerebrum, cerebral, cerebellar
bi-	two	biceps, bilayer, bifurcate
tri-	three	triceps, trismus
-or	agent, one that performs a specified action	flexor, extensor, adductor

Notes

- major functions of bones:** providing a strong barrier that protects the inner organs; supporting your body against the constant pull of gravity; producing blood cells (the marrow inside of bones produce blood cells); allowing you to move; storing important mineral.
- types of ossification:** endochondral ossification, formation of bone from tissue; intramembranous ossification, dissolution of bone from mesenchyme, esp. round bones found in the pelvis; heterotopic ossification, detachment of bone in extraskeletal hard tissue, esp. in connective tissue or muscle tissue.
- classifications of joints:** immovable, or fibrous joints that don't move; partially movable, or cartilaginous joints that move a little; freely movable, or synovial joints that move in many directions.

Post-reading Activities

I. Decide whether the following statements are True or False.

- The boys' and girls' growth plates change into hard bone at the same age.
- The human body has altogether 206 bones and 650 muscles.

3. When a person sits perfectly still, the muscles throughout one's body will not move.
4. The brain and the nervous system coordinate and control the movements which the muscles make.
5. The motor cortex on the right side of the brain controls the muscles on the right side of the body and vice versa.

II. Choose the best answer.

1. Stem cell can produce the body's _____.
 A. red blood cells and platelets
 B. white blood cells and platelets
 C. periosteum
 D. marrow
2. Compact bone has the feature of _____.
 A. looking like a sponge
 B. making up of a mesh-like network
 C. the soft, inside part of the bone
 D. hard, outside part of the bone
3. The voluntary muscles are regulated by the parts of the brain known as _____.
 A. the cerebral motor cortex and the brain stem
 B. the cerebellum and the pons
 C. the cerebral motor cortex and the cerebellum
 D. the peripheral nerves
4. Which of the following statements is not true about muscles?
 A. Skeletal muscle is made up of fibers that have horizontal stripes.
 B. Smooth muscle is not made of fibers, which looks smooth, not striated.
 C. Cardiac muscle is an involuntary type of muscle which is found in the heart.
 D. Humans have three types of muscle: skeletal muscle, smooth muscle and cardiac muscle.
5. Which of the following statements is true according to the passage?
 A. Bones provide support for bodies and help form the shape.
 B. Joints occur when bones or muscles meet.
 C. Muscles move body parts only by contracting.
 D. Tendons are soft tissues which connect bones and muscles.

III. Answer the following questions.

1. What are the main contents of bones?
2. What is ossification and how long will the process of ossification last?
3. What factors do the bones of kids and young teens contain which are different from adults?
4. How many types of cells do the human bones contain? What are they?
5. How many kinds of muscles are there in the human body? What are they?

IV. Choose the proper words from the word bank. Change the form where necessary.

replace	renew	reshape	perform	contract
relax	coordinate	multiply	release	shelter

1. The non-alcoholic toning water with collagen, can _____ the skin pores.
2. One can do everyday physical activities more easily through _____ the movements of the arms and legs.
3. It is possible to _____ bacteria and other living organisms in the laboratory.
4. Betting the intussusception problem could be overcome, two vaccine makers _____ their interest in

rotavirus.

5. Before the age of three, _____ vaccinations is very important to prevent infection.
6. Although trillions of cells meet this fate daily, all are _____ as effortlessly as they are discarded.
7. It may involve _____ or moving tissues to fill a depression, cover a wound, or improve appearance.
8. Acupressure is used to _____ tension spots in the shoulders and neck.

V. Translate the following sentences into Chinese.

1. Holes and channels run through it, carrying blood vessels and nerves from the periosteum, the bone's membrane covering, to its inner parts.
2. Muscles enable the heart to beat, the chest to rise and fall as one breathes, and the blood vessels to help regulate the pressure and flow of blood through the body.
3. When a person decides to move, the motor cortex sends an electrical signal through the spinal cord and peripheral nerves to the muscles, causing them to contract.
4. Then, when having completed the movement, the flexor relaxes and the extensor contracts to extend or straighten the limb at the same joint.
5. Sensors in the muscles and joints send messages back through peripheral nerves to tell the cerebellum and other parts of the brain where and how the arm or leg is moving and what position it's in.



Passage B

Bone Development and Growth

Introduction

- ① Growth takes place at the **epiphyseal** growth plate of long bones by a finely balanced cycle of cartilage growth, matrix formation and calcification of cartilage that acts as a scaffold for bone formation. This sequence of cellular events constitutes **endochondral** ossification¹. Another feature of bone growth is a process of modelling, where bone is being continuously resorbed and replaced by new bone². Modelling is most active during childhood and adolescence, and enables long bones to increase in diameter, to change shape and develop a marrow cavity. Modelling continues throughout adult life with bone resorption equally balanced by bone formation in a healthy skeleton, although in the adult the process is referred to as remodelling. An individual's skeletal growth rate and adult limb bone length have an important genetic determinant, but are influenced by many factors including circulating hormones, nutritional intake, mechanical influences and disease.

Skeletal Morphogenesis and Growth

- ② The embryonic primordia of the **appendicular** skeleton are the limb buds, which are mesodermal structures covered by **ectoderm**. The first visible outline of the embryonic limb follows a condensation of mesenchymal cells which subsequently differentiate into cartilage cells, the **chondrocytes**. These cells secrete a matrix and so produce cartilaginous models of the future bones. Surrounding this cartilage is the **perichondrium**, the outer layer of which becomes a connective tissue sheath while the inner cells remain pluripotential. This cartilage rudiment grows by interstitial and appositional growth, and a vascular

system develops to invade the perichondrium. A collar of bone is then laid down around the mid-shaft of the bone. This ossification is a result of the inner **perichondrial** cells differentiating into bone forming cells, the osteoblasts. At the same time the osteoblasts, together with capillaries, invade the centre of the shaft to form a primary or **diaphyseal** ossification centre, at a site where the cartilage cells and matrix have begun to disintegrate. **Trabecular** bone is then deposited on cartilaginous remnants. The embryonic bone increases in width by appositional growth, and the central cancellous bone core gradually becomes resorbed to form a marrow cavity.

- 3 In long bones, another secondary centre of ossification appears at the growing cartilaginous ends, the epiphyseal ossification centre. This ossification does not replace the cartilage at the articular end of the model; this remains as articular cartilage. In addition, a transverse plate of cartilage extends across the bone separating the epiphyseal from the diaphyseal ossification centre. This is the epiphyseal growth plate that persists until an individual stops growing. Growth of cartilage in the epiphyseal plate is continuous, but the plate does not become thickened because on its diaphyseal side the cartilage matures, is calcified, resorbed and replaced by bone. This is endochondral ossification, the mechanism responsible for increasing the length of the bone. In the growing child this is a site of many complex cellular events; namely cartilage growth, maturation, resorption and bone formation. Disturbance of any one of these processes may be reflected in growth retardation.
- 4 As an individual's height increases, the bone must increase its diameter, and this is achieved by new bone being laid down by the **osteogenic** layer of the periosteum. This is **intramembranous** ossification that does not involve prior cartilage formation. However, the shafts of long bones do not increase in width significantly, as this would increase skeletal mass excessively, because there is resorption of bone on the inner (**endosteal**) surface by bone resorbing cells, the osteoclasts. This leads to an increase in the size of the marrow cavity with age, and means that the cortical bone of an adult's femur, for example, is not the same bone that existed in childhood. The cycle of bone resorption and formation is bone remodelling, and in the growing skeleton this is often described as "structural modeling". Remodelling of bone is a dynamic process that continues throughout life with losses from osteoclastic bone resorption made good by bone formation. **Histomorphometric** studies of bone have shown that in the remodelling cycle osteoclasts resorb bone surfaces to form an erosion cavity. Mononuclear cells then fill in the cavity, differentiate into osteoblasts and begin to lay down matrix. It has been estimated that this process can take up to three months with mature osteoblasts secreting matrix for up to 100 days. This balanced process is described as coupling, and it is the uncoupling of formation from resorption that leads to skeletal diseases such as osteoporosis where net resorption is greater than formation.

Structure of the Growth Plate

- 5 The epiphyseal growth plate is made up of three tissue types: the cartilage component divided into distinct zones, the bony tissue of the **metaphysis** and the fibrous tissue that surrounds the growth plate. The secondary ossification centre is supplied by the epiphyseal artery, branches of which end in the proliferating cartilage zone. The metaphysis is supplied mainly by the nutrient artery, with the periphery having an additional supply from metaphyseal vessels. Since there are no branches from metaphyseal or epiphyseal arteries to the **hypertrophic** zone, this region of the growth plate is **avascular**. Only the

proliferative zone has an abundant blood supply.

- ⑥ The cartilage matrix is primarily composed of collagens and **proteoglycans**. These macromolecules play a critical role in the development and maintenance of a variety of functions including tissue strength, architecture, and cell to cell interactions. If abnormal molecules are present in the matrix, it can lose its functional integrity, and the organised arrangement of chondrocytes and their closely regulated proliferation and biosynthesis will be disrupted. Such abnormalities are called **dyschondroplasias**³, and affected individuals suffer from dwarfism. Fortunately the understanding of cartilage matrix molecules has progressed significantly in recent years with the development of techniques enabling improved protein characterisation and localisation, together with knowledge of the gene structure of many matrix molecules. It is now known that genetic defects of a single matrix molecule are the cause of some of these dyschondroplasias.

New Words and Phrases

epiphyseal /,epɪ'fɪziəl/ <i>a.</i>	relating to the epiphysis of a bone 骺的
endochondral /,endə'kɒndrəl/ <i>a.</i>	within cartilage 软骨内的
morphogenesis /mɔːfə'dʒenɪsɪs/ <i>n.</i>	differentiation and growth of the structure of an organism (or a part of an organism) 形态发生
appendicular /,æp(ə)n'dɪkjʊlə/ <i>a.</i>	relating to or consisting of an appendage or appendages, especially the limbs 附属物的, 四肢的
ectoderm /'ektə(ʊ)dʒ:m/ <i>n.</i>	the outer germ layer that develops into skin and nervous tissue 外胚层
chondrocyte /kɒndrəʊsɪt/ <i>n.</i>	a mature cartilage cell embedded in a lacuna within the cartilage matrix 软骨细胞
perichondrium /,perɪ'kɒndrɪəm/ <i>n.</i>	the membrane of white, fibrous connective tissue covering cartilage 软骨膜
perichondrial /perɪ'kɒndrɪəl/ <i>a.</i>	of or pertaining to the perichondrium, situated around cartilage 软骨膜的
diaphyseal /,daɪə'fɪziəl/ <i>a.</i>	relating to the diaphysis of a bone 骨干的
trabecular /trə'bekjʊlə/ <i>a.</i>	of or relating to trabeculae 有小梁的
osteogenic /,ɒstɪə'dʒenɪk/ <i>a.</i>	derived from or composed of any tissue concerned in bone growth or repair 成骨的, 骨原性的
intramembranous /,ɪntrə'mem'breɪnəs/ <i>a.</i>	within, or between the layers of a membrane 膜内的
endosteal /en'dɒstriəl/ <i>a.</i>	of or relating to the endosteum, located within bone or cartilage 位于骨内的, 骨内膜的
histomorphometric /hɪstəmɔːfə'metrɪk/ <i>a.</i>	quantitative measuring and characterizing of microscopical images using a computer 组织形态测定的

metaphysis /mɪ'tæfɪsɪs/ <i>n.</i>	the growing part of a long bone between the diaphysis and the epiphysis 干骺端
hypertrophic /ˌhaɪpə'trɒfɪk/ <i>a.</i>	enlarging or overgrowing of an organ or part due to an increase in size of its constituent cells 肥大的, 肥厚的
avascular /eɪ'væskjələ/ <i>a.</i>	without blood vessels (组织等) 无血管的
proliferative /prəˌlɪfə'reɪtɪv/ <i>a.</i>	capable of or engaged in proliferation 增生性的, 增殖的
proteoglycan /ˌprəʊtɪəʊ'glɑɪkæn/ <i>n.</i>	a high molecular weight complex of protein and polysaccharide, characteristic of structural tissues of vertebrates, such as bone and cartilage, but also present on cell surfaces 蛋白聚糖, 蛋白多糖
dyschondroplasia /dɪs,kɒndrəʊ'pleɪzɪə/ <i>n.</i>	benign growths of cartilage in the metaphyses of several bones 内生软骨瘤病, 软骨发育异常

Notes

1. **endochondral ossification:** one of the two essential processes during fetal development of the mammalian skeletal system by which bone tissue is created. It is also an essential process during the rudimentary formation of long bones, the growth of the length of long bones, and the natural healing of bone fractures.
2. **bone replacement:** the old bone tissue is replaced by the new bone tissue. It has two processes: the old bone tissue is removed; the new bone tissue is created.
3. **dyschondroplasia:** a somewhat rare developmental error, characterized by rounded masses or columns of unossified cartilage in the metaphyses and diaphyses of certain bones. It was first described by Ollier in 1900.



Post-reading Activities

I. Choose the best answer.

1. Which of the following is true about modeling?
 - A. Modelling is most active during adulthood and old age.
 - B. Modelling is most active during childhood and adolescence.
 - C. Modelling stops at adolescence.
 - D. Modelling stops at childhood.
2. The first visible outline of the embryonic limb follows a condensation of _____ which subsequently differentiate into cartilage cells, the chondrocytes.
 - A. perichondrial cells
 - B. capillaries
 - C. trabecular bone
 - D. mesenchymal cells

3. The epiphyseal growth plate is made up of the following three tissue types except _____.
 - A. the cartilage component divided into distinct zones
 - B. the bony tissue of the metaphysis
 - C. the fibrous tissue that surrounds the growth plate
 - D. the strength tissue of bones
4. Which of the following statements is not mentioned about the critical roles of collagens and proteoglycans?
 - A. Cell division.
 - B. Tissue strength.
 - C. Architecture.
 - D. Cell to cell interactions.
5. Which of the following is true according to the passage?
 - A. The inner cells of perichondrium will become connective tissues.
 - B. The outer layer of perichondrium will remain pluripotential.
 - C. As an individual's height increases, the bone must increase its diameter.
 - D. The cartilage matrix is only composed of collagens and proteoglycans.

II. Translate the following sentences into Chinese.

1. An individual's skeletal growth rate and adult limb bone length have an important genetic determinant, but are influenced by many factors including circulating hormones, nutritional intake, mechanical influences and disease.
2. The first visible outline of the embryonic limb follows a condensation of mesenchymal cells which subsequently differentiate into cartilage cells, the chondrocytes.
3. At the same time the osteoblasts, together with capillaries, invade the centre of the shaft to form a primary or diaphyseal ossification centre, at a site where the cartilage cells and matrix have begun to disintegrate.
4. Growth of cartilage in the epiphyseal plate is continuous, but the plate does not become thickened because on its diaphyseal side the cartilage matures, is calcified, resorbed and replaced by bone.
5. This balanced process is described as coupling, and it is the uncoupling of formation from resorption that leads to skeletal diseases such as osteoporosis where net resorption is greater than formation.

Unit 2

2



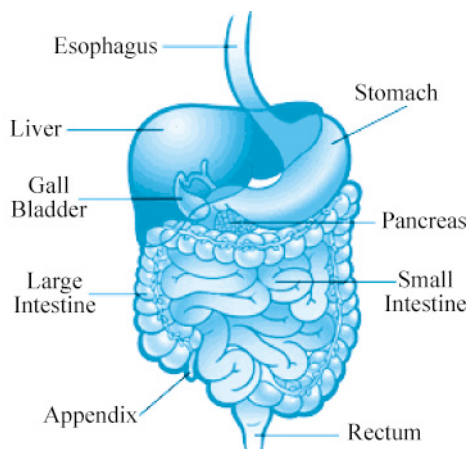
Passage A

The Digestive System and How It Works



Pre-reading Activities

I. Look at the diagram below. Discuss the structure of the digestive system and how it works.



II. Try to understand the following terms before your reading.

mucosa /mju:'kəʊsə/ *n.* lining of the hollow organs of the digestive system 粘膜

peristalsis /,peri'stælsɪs/ *n.* the process of wavelike muscle contractions of the alimentary tract that moves food along 蠕动

enzyme /'enzaim/ *n.* proteins that act as a catalyst in mediating and speeding a specific chemical reaction 酶

esophagus /ɪ(:)'sɒfəgəs/ *n.* the muscular tube in vertebrates through which food passes 食道

gland /glænd/ *n.* an organ in the body which produces a chemical substance needed by the body 腺, 分泌腺



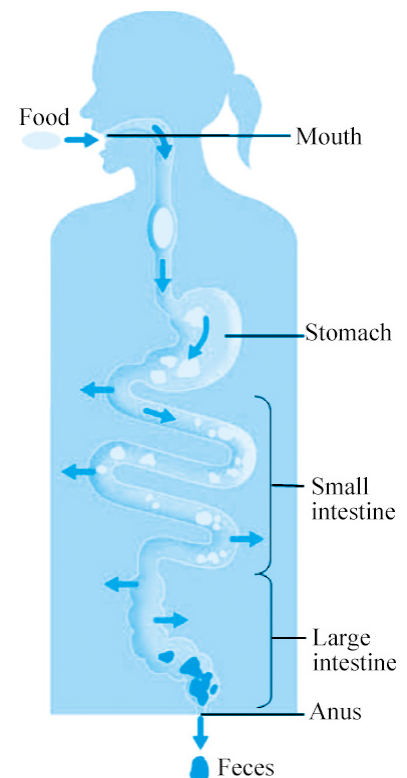
Text

Introduction

- ① The digestive system is a series of hollow organs joined in a long, **twisting** tube from the mouth to the **anus**. Inside this tube is a lining called the mucosa. In the mouth, stomach, and small intestine, the mucosa contains tiny glands that produce juices to help digest food. Two solid organs, the liver and the **pancreas**, produce digestive juices that reach the intestine through small tubes. In addition, parts of other organ systems play a major role in the digestive system. Digestion is the process by which food and drink are broken down into their smallest parts so that the body can use them to build and **nourish** cells and to provide energy.
- ② Digestion involves the mixing of food, its movement through the digestive **tract**¹, and chemical breakdown² of the large **molecules** of food into smaller molecules. Digestion begins in the mouth, when we chew and swallow, and is completed in the small intestine. The chemical process varies somewhat for different kinds of food.

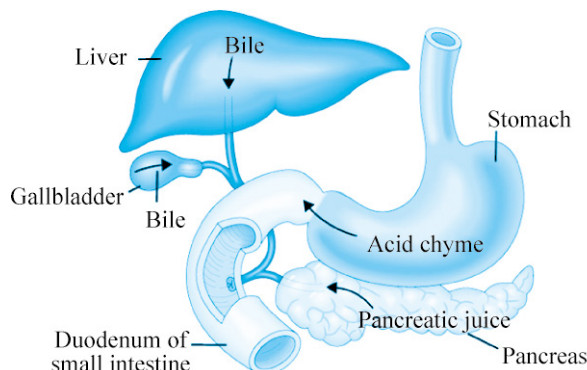
Movement of Food through the System

- ③ The movement of organ walls can propel food and liquid and also can mix the contents within each organ. Typical movement of the esophagus, stomach, and intestine is called peristalsis. The action of peristalsis looks like an ocean wave moving through the muscle. The muscle of the organ produces a narrowing and then propels the narrowed portion slowly down the length of the organ. These waves of narrowing push the food and fluid in front of them through each hollow organ.
- ④ The first major muscle movement occurs when food or liquid is swallowed. Although we are able to start swallowing by choice, once the swallow begins, it becomes involuntary and proceeds under the control of the nerves.
- ⑤ The esophagus is the organ into which the swallowed food is pushed. It connects the throat above with the stomach below. At the junction of the esophagus and stomach, there is a ring like valve closing the passage between the two organs. However, as the food approaches the closed ring, the surrounding muscles relax and allow the food to pass.
- ⑥ The food then enters the stomach, which has three mechanical tasks³ to do. First, the stomach must store the swallowed food and liquid. This requires the muscle of the upper part of the stomach to relax and accept large volumes of swallowed material. The second job is to mix up the food, liquid, and digestive juice produced by the stomach. The lower part of the stomach mixes these materials by its muscle action. The third task of the stomach is to empty its contents slowly into the small intestine.
- ⑦ As the food is digested in the small intestine and **dissolved** into the juices from the pancreas, liver, and intestine, the contents of the intestine are mixed and pushed forward to allow further digestion.



- 8 Finally, all of the digested nutrients are absorbed through the intestinal walls. The waste products of this process include undigested parts of the food, known as fiber, and older cells that have been **shed** from the mucosa. These materials are propelled into the **colon**, where they remain, usually for a day or two, until the **feces** are expelled by a bowel movement.

Production of Digestive Juices



- 9 The glands that act first are in the mouth — the **salivary** glands. **Saliva** produced by these glands contains an enzyme that begins to digest the **starch** from food into smaller molecules.
- 10 The next set of digestive glands is in the stomach lining. They produce stomach acid and an enzyme that digests protein. In most people, the stomach mucosa is able to resist the juice, although food and other tissues of the body cannot.
- 11 After the stomach empties the food and juice mixture into the small intestine, the juices of two other digestive organs mix with the food to continue the process of digestion. One of these organs is the pancreas. It produces a juice that contains a wide **array** of enzymes to break down the carbohydrate, fat, and protein in food. Other enzymes that are active in the process come from glands in the wall of the intestine or even a part of that wall.
- 12 The liver produces yet another digestive juice — bile. The **bile** is stored between meals in the **gallbladder**. At mealtime, it is squeezed out of the gallbladder into the bile **ducts** to reach the intestine and mix with the fat in food. The bile **acids** dissolve the fat into the watery contents of the intestine. After the fat is dissolved, it is digested by enzymes from the pancreas and the lining of the intestine.

Absorption and Transport of Nutrients

- 13 Digested molecules of food, as well as water and minerals from the diet, are absorbed from the **cavity** of the upper small intestine. Most absorbed materials cross the mucosa into the blood and are carried off in the **bloodstream** to other parts of the body for storage or further chemical change.
- 14 *Carbohydrates:* The **digestible** carbohydrates are broken into simpler molecules by enzymes in the saliva, in juice produced by the pancreas, and in the lining of the small intestine. Starch is digested in two steps: First, an enzyme in the saliva and **pancreatic** juice breaks the starch into molecules called **maltose**; then an enzyme in the lining of the small intestine splits the maltose into **glucose** molecules that can be absorbed into the blood. Glucose is carried through the bloodstream to the liver, where it is stored or used to provide energy for the work of the body.
- 15 *Protein:* Foods such as meat, eggs, and beans consist of giant molecules of protein that must be

digested by enzymes before they can be used to build and repair body tissues. An enzyme in the juice of the stomach starts the digestion of swallowed protein. Further digestion of the protein is completed in the small intestine. Here, several enzymes from the pancreatic juice and the lining of the intestine carry out the breakdown of huge protein molecules into small molecules called **amino acids**.

- 16 *Fats:* Fat molecules are a rich source of energy for the body. The first step in digestion of a fat such as butter is to dissolve it into the watery content of the intestinal cavity. The bile acids produced by the liver act as natural **detergents** to dissolve fat in water and allow the enzymes to break the large fat molecules into smaller molecules, some of which are fatty acids and **cholesterol**. The bile acids combine with the fatty acids and cholesterol and help these molecules to move into the cells of the mucosa.
- 17 *Vitamins:* Another vital part of our food that is absorbed from the small intestine is the class of chemicals called vitamins. The two different types of vitamins are classified by the fluid in which they can be dissolved: water-soluble vitamins⁴ and fat-soluble vitamins.
- 18 *Water and salt:* Most of the material absorbed from the cavity of the small intestine is water in which salt is dissolved. The salt and water come from the food and liquid we swallow and the juices secreted by the many digestive glands.

How Is the Digestive Process Controlled

- 19 A fascinating feature of the digestive system is that it contains its own regulators. The major **hormones** that control the functions of the digestive system are produced and released by cells in the mucosa of the stomach and small intestine. These hormones are released into the blood of the digestive tract, travel back to the heart and through the arteries, and return to the digestive system, where they stimulate digestive juices and cause organ movement. The hormones that control digestion are **gastrin**, **secretin**, and **cholecystokinin (CCK)**.
- 20 Gastrin causes the stomach to produce an acid for dissolving and digesting some foods. It is also necessary for the normal growth of the lining of the stomach, small intestine, and colon.
- 21 Secretin causes the pancreas to send out a digestive juice that is rich in **bicarbonate**. It stimulates the stomach to produce pepsin, an enzyme that digests protein, and it also stimulates the liver to produce bile.
- 22 CCK causes the pancreas to grow and to produce the enzymes of pancreatic juice, and it causes the gallbladder to empty.

Nerve Regulators

- 23 Two types of nerves help to control the action of the digestive system. Extrinsic nerves come to the digestive organs from the unconscious part of the brain or from the spinal cord. They release a chemical called **acetylcholine** and another called adrenaline. Acetylcholine causes the muscle of the digestive organs to squeeze with more force and increase the “push” of food and juice through the digestive tract. Acetylcholine also causes the stomach and pancreas to produce more digestive juice. Adrenaline relaxes the muscle of the stomach and intestine and decreases the flow of blood to these organs.
- 24 Even more important, though, are the intrinsic nerves, which make up a very dense network embedded in the walls of the esophagus, stomach, small intestine, and colon. The intrinsic nerves are

triggered to act when the walls of the hollow organs are stretched by food. They release many different substances that speed up or delay the movement of food and the production of juices by the digestive organs.



New Words and Phrases

twist /twɪst/ <i>v.</i>	to cause to change shape; bend 扭曲，使变形
anus /'eɪnəs/ <i>n.</i>	the opening at the end of the digestive tract where the bowel contents leave the body 肛门
pancreas /'pæŋkriəs/ <i>n.</i>	gland that makes enzymes for digestion and the hormone, insulin 胰腺
nourish /'naʊrɪʃ/ <i>v.</i>	to provide with nourishment; give nourishment to 滋养，使……健壮
tract /trækt/ <i>n.</i>	a system of body parts that together serve some particular purpose 系统；道
molecule /'mɒlɪkjʊ:l/ <i>n.</i>	the smallest amount of a chemical substance which can exist by itself 分子
dissolve /dɪ'zɒlv/ <i>v.</i>	to cause to go into a solution 使溶解；使融化
shed /ʃed/ <i>v.</i>	to cause or allow (a solid substance) to flow or run out or over 使……流出
colon /kəʊ'lən/ <i>n.</i>	the part of the large intestine between the cecum and the rectum 结肠
feces/faeces /'fi:si:z/ <i>n.</i>	solid wastes that pass through the rectum as bowel movements 粪便
salivary /'sælɪvəri/ <i>a.</i>	of or relating to saliva 唾液的
saliva /sə'lɑɪvə/ <i>n.</i>	mixture of water, protein and salts that makes food easy to swallow and begins digestion 唾液；唾沫
starch /stɑ:tʃ/ <i>n.</i>	a complex carbohydrate found chiefly in seeds, fruits, tubers, roots and stem pith of plants, notably in corn, potatoes, wheat, and rice 淀粉
array /ə'reɪ/ <i>n.</i>	an orderly arrangement; an impressive display 排列；陈列
bile /beɪl/ <i>n.</i>	a yellow-green fluid that is made by the liver 胆汁
gallbladder /'gɔ:lblædə/ <i>n.</i>	a muscular sac attached to the liver that secretes bile and stores it until needed for digestion 胆囊
duct /dʌkt/ <i>n.</i>	a bodily passage or tube lined with epithelial cells and conveying a secretion or other substance 管道
acid /'æsɪd/ <i>n.</i>	any of various water-soluble compounds having a sour taste and capable of turning litmus red and reacting with a base to form a salt 酸
cavity /'kævɪti/ <i>n.</i>	a natural hollow or sinus within the body 腔
bloodstream /'blʌdstri:m/ <i>n.</i>	the blood flowing through the circulatory system 血流
digestible /dɪ'dʒestəbl/ <i>a.</i>	capable of being converted into assimilable condition in the alimentary canal 易消化的

pancreatic /ˌpæŋkrɪ'ætɪk/ <i>a.</i>	of or involving the pancreas 胰腺的
maltose /'mɔ:ltaʊz/ <i>n.</i>	starch which has been broken into molecules 麦芽糖
glucose /'glu:kəʊs/ <i>n.</i>	natural type of sugar 葡萄糖
amino /ə'mi:nəʊ/ <i>a.</i>	pertaining to or containing any of a group of organic compounds of nitrogen derived from ammonia 氨基的
detergent /dɪ'tɜ:dʒənt/ <i>n.</i>	a cleansing agent that differs from soap but can also emulsify oils and hold dirt in suspension 清洁剂
cholesterol /kə'lestərəʊl/ <i>n.</i>	an animal sterol that is normally synthesized by the liver, the most abundant steroid in animal tissues 胆固醇
hormone /'hɔ:məʊn/ <i>n.</i>	a chemical released by a cell or a gland in one part of the body that sends out messages that affect cells in other parts of the organism 激素, 荷尔蒙
gastrin /'gæstrɪn/ <i>n.</i>	a peptide hormone that stimulates secretion of gastric acid by the parietal cells of the stomach and aids in gastric motility 胃泌激素
secretin /sɪ'kri:tɪn/ <i>n.</i>	a hormone that controls the secretions into the duodenum, and also separately, water homeostasis throughout the body 分泌素
cholecystokinin /ˌkəʊlɪsɪstə'kaɪnɪn/ <i>n.</i>	a gastrointestinal hormone that stimulates the secretion of pancreatic enzymes and the contraction and emptying of the gallbladder 缩胆囊素, 肠促胰酶肽
bicarbonate /baɪ'kɑ:bənɪt/ <i>n.</i>	a salt of carbonic acid (containing the anion HCO ₃) in which one hydrogen atom has been replaced 重碳酸盐
acetylcholine /ˌæstɪl'kəʊlɪn/ <i>n.</i>	a neurotransmitter that is a derivative of choline, released at the ends of nerve fibers in the somatic and parasympathetic nervous systems 乙酰胆碱

► Word Building

Stems/Affixes	Meaning	Examples
eso-	inner	esophagus, esophagitis
dis-	separate	dissolve, disinfection
gluc(o)-/glyc(o)-	sweetness	glucose, glucagon
de-	remove	detergent, deoxygenate
-ose	sugar	glucose, maltose
-ine	protein	methionine, cysteine, hydroxyproline

Notes

1. **digestive tract:** the organs that are involved in digestion, including the mouth, salivary glands, esophagus, stomach, pancreas, liver, gall bladder, small intestine and large intestine.
2. **chemical breakdown:** digestive chemicals called enzymes break apart individual molecules of food which can be absorbed and distributed throughout the body.
3. **mechanical tasks:** three acts required within the stomach (to store, to mix and to empty).
4. **water-soluble vitamins and fat-soluble vitamins:** vitamins are classified as either water-soluble or fat-soluble. In humans there are 13 vitamins: 4 fat-soluble (A, D, E And K) and 9 water-soluble (8 B vitamins and vitamin C).



Post-reading Activities

I. Decide whether the following statements are True or False.

1. Once the swallow begins, nerves control further involuntary action.
2. Undigested parts of food are stored in the colon before they are expelled.
3. Bile acids dissolve fats into the contents of the intestine.
4. An enzyme in the lining of the stomach is called “maltose”.
5. “Peristalsis” occurs only in the oesophagus and stomach.

II. Choose the best answer.

1. The liver contributes to digestion by _____.
 A. grinding food into tiny particles
 B. removing excess water and returning it to the blood stream
 C. storing bile in the liver
 D. secreting bile into the small intestine
2. Most vitamins are _____.
 A. classified by their color
 B. absorbed from the small intestine
 C. water soluble
 D. fat soluble
3. The first glands to assist with digestion are found in the _____.
 A. stomach lining B. pancreas C. liver D. mouth
4. Which can cause the gallbladder to empty?
 A. Gastric acid. B. Gastrin. C. Cholecystokinin. D. Bile.
5. The solid organs which produce digestive juices are the _____.
 A. liver and pancreas
 B. gall bladder and bowel
 C. stomach and small intestines
 D. pancreas and gall bladder

III. Answer the following questions.

1. What's the function of the gallbladder?
2. What are the three mechanical tasks of the stomach?
3. Which organs produce digestive juices?

4. How do the extrinsic nerves help to control the action of the digestive system?
5. What helps swallowed protein to be digested?

IV. Choose the proper words from the word bank. Change the form where necessary.

peristalsis	split	release	propel	stimulate
resist	dissolve	swallow	digest	absorb

1. We have to _____ the news before 5 o'clock tomorrow morning.
2. These proteins _____ the production of blood cells.
3. Lack of proper nourishment reduces their power to _____ disease.
4. You are asked to _____ a capsule containing vitamin B.
5. Humans cannot _____ plants such as grass.
6. Drugs that _____ blood clots can help people survive heart attacks.
7. Why can cod liver oil promote calcium to _____?
8. These rhythmic waves of muscular relaxation and contraction are called _____.

V. Translate the following sentences into Chinese.

1. Digestion is the process by which food and drink are broken down into their smallest parts so that the body can use them to build and nourish cells and to provide energy.
2. Digestion involves the mixing of food, its movement through the digestive tract, and chemical breakdown of the large molecules of food into smaller molecules.
3. As the food is digested in the small intestine and dissolved into the juices from the pancreas, liver, and intestine, the contents of the intestine are mixed and pushed forward to allow further digestion.
4. These hormones are released into the blood of the digestive tract, travel back to the heart and through the arteries, and return to the digestive system, where they stimulate digestive juices and cause organ movement.
5. Acetylcholine causes the muscle of the digestive organs to squeeze with more force and increase the "push" of food and juice through the digestive tract.



Passage B

Digestive System

Introduction

- ① Digestion generally involves two phases: a mechanical phase and a chemical phase. In the mechanical phase, teeth or other structures physically break down large pieces of food into smaller pieces. In the chemical phase, digestive chemicals called enzymes break apart individual molecules of food to yield molecules that can be absorbed and distributed throughout the body. These enzymes are secreted (produced and released) by glands in the body.

The Human Digestive System

- ② If a human adult's digestive tract were stretched out, it would be 6 to 9m long. In humans, digestion begins in the mouth, where both mechanical and chemical digestions occur. The mouth quickly converts