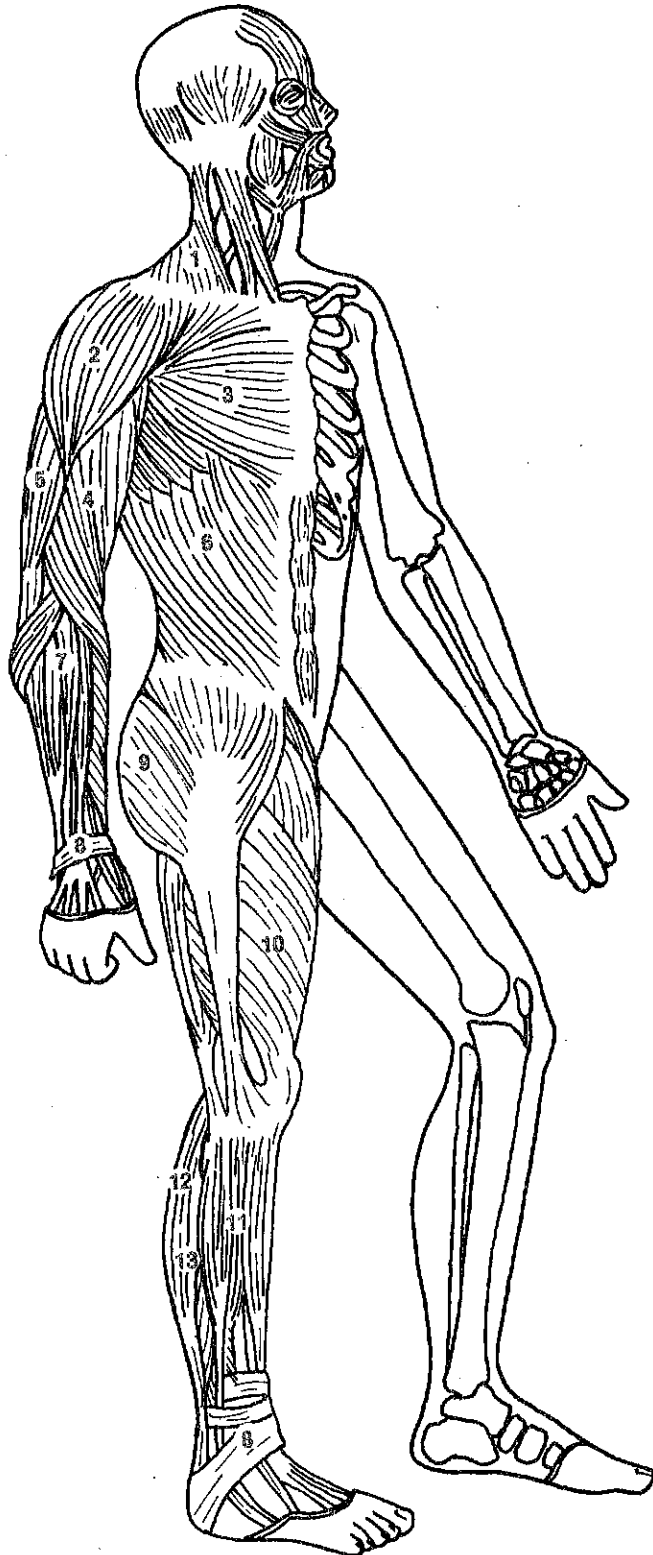


# MUSCULAR SYSTEM

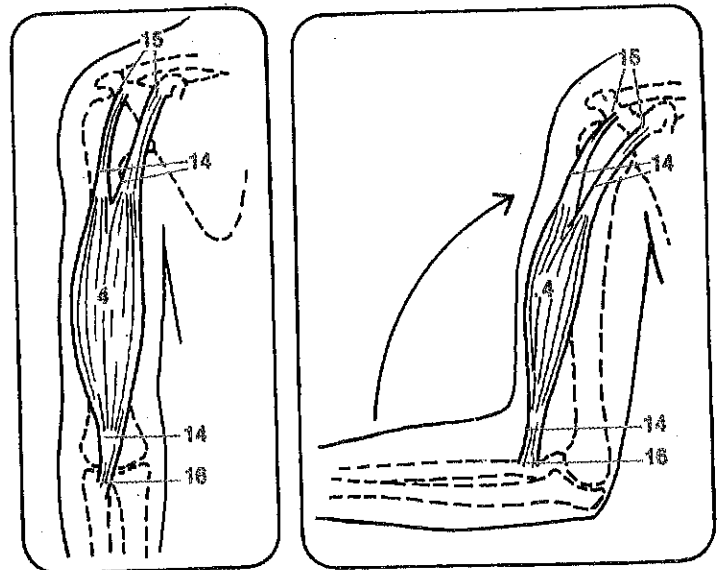
Muscles are tissues that contract, and the human body has almost seven hundred of them, which are divided into three kinds. *Skeletal muscles* are responsible for the voluntary movement of the bones. *Smooth muscles* are involuntary; they include blood vessels, intestines, and the lungs. There is only one *cardiac muscle*—the heart.



The term *muscular system* is used only for the skeletal muscles, which are the long, slender fibers arranged in parallel bundles that give our arms, legs, torso, neck, and face much of their shape. The large part of the muscle is called the *belly*. The ends of the skeletal muscles are attached by ligaments to two different bones, only one of which moves when the muscle contracts. The *origin* is where the muscle meets the bone that doesn't move. The origin is always closer to the torso than the *insertion*, where the muscle meets the bone that does move. Muscles that bend joints and pull limbs toward the body are called *flexors*. Muscles that straighten joints are *extensors*.

Movement usually involves the coordinated action of several muscles. The muscle that initiates the action is the *agonist* or *prime mover*. As the agonist contracts, another muscle, the *antagonist*, relaxes or yields to it. Other muscles, *synergists* or *fixators*, help the prime mover by dampening unwanted movement or holding a limb or joint steady during the action.

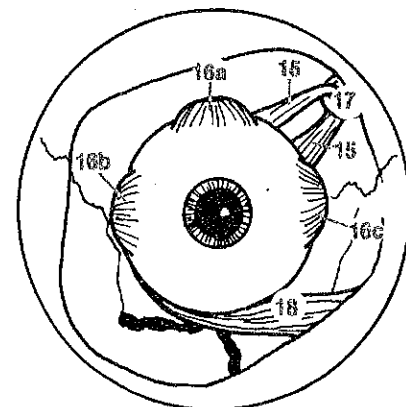
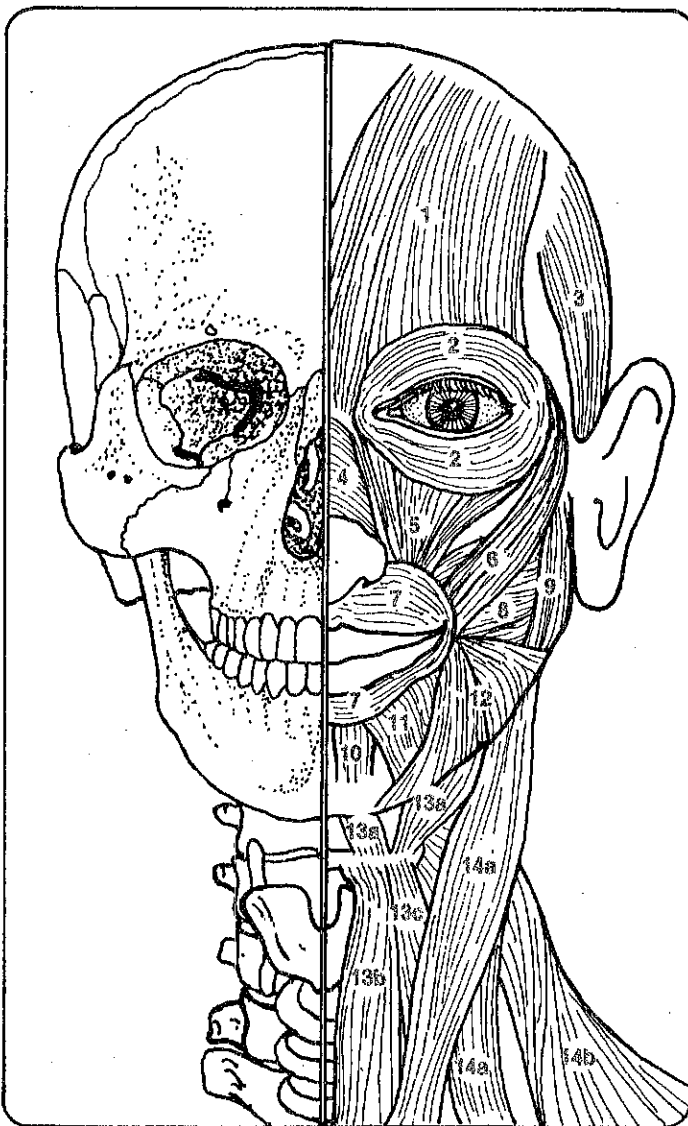
- |                         |       |              |
|-------------------------|-------|--------------|
| 1. TRAPEZIUS            | _____ | Pink         |
| 2. DELTOID              | _____ | Orange       |
| 3. PECTORALIS           | _____ | Light Blue   |
| 4. BICEPS               | _____ | Green        |
| 5. TRICEPS              | _____ | Turquoise    |
| 6. EXTERNAL OBLIQUE     | _____ | Light Brown  |
| 7. EXTENSORS            | _____ | Yellow       |
| 8. ANNULAR LIGAMENT     | _____ | Gray         |
| 9. GLUTEUS MAXIMUS      | _____ | Purple       |
| 10. QUADRICEPS          | _____ | Red          |
| 11. PERONEUS            | _____ | Blue         |
| 12. GASTROCNEMIUS       | _____ | Pink         |
| 13. SOLEUS              | _____ | Yellow-Green |
| 14. TENDON              | _____ | Flesh        |
| 15. ORIGIN OF MUSCLE    |       |              |
| 16. INSERTION OF MUSCLE |       |              |



# MUSCLES OF THE FACE, HEAD, AND NECK

The complex muscles of the head and neck are capable of rotation and powerful movement as well as the minute coordinated actions that express slight emotional changes in the face. Unlike most skeletal muscles, the face and head muscles are not attached to a moving limb. Instead they insert either into the flat bones of the skull or face or into head tissue such as the lip or skin of the chin. The *muscles of facial expression*, located near the skin (superficial muscles), register emotion and also help you chew and speak. The *muscles of mastication* move the lower jaw primarily for chewing, but they also are necessary for speaking. The *muscles of the tongue* help with chewing and swallowing and are extremely important for making the complex movements required for human speech. Some of the tongue muscles have both their origin and insertion at the hyoid bone; others insert into the tongue. The *muscles of the neck* arise primarily from the sternum and clavicle and as far down as the sixth vertebra. Neck muscles permit you to rotate and extend your head.

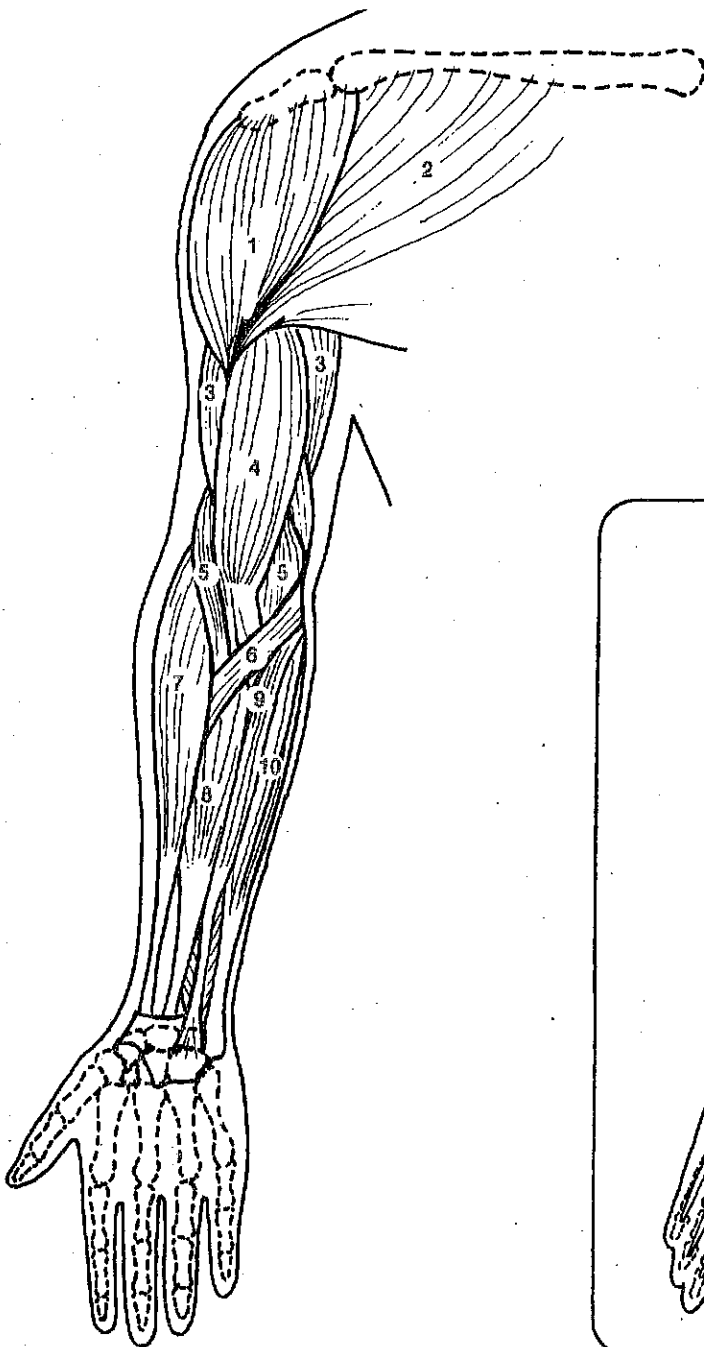
1. FRONTALIS \_\_\_\_\_ Orange
2. ORBICULARIS OCULI \_\_\_\_\_ Light Blue
3. TEMPORALIS \_\_\_\_\_ Purple
4. COMPRESSOR NARIS \_\_\_\_\_ Pink
5. LEVATOR LABII SUPERIORIS \_\_\_\_\_ Light Green
6. ZYGOMATICUS \_\_\_\_\_ Yellow
7. ORBICULARIS ORIS \_\_\_\_\_ Blue
8. BUCCINATOR \_\_\_\_\_ Light Brown
9. MASSETER \_\_\_\_\_ Red
10. MENTALIS \_\_\_\_\_ Brown
11. DEPRESSOR LABII INFERIORIS \_\_\_\_\_ Green
12. TRIANGULARIS \_\_\_\_\_ Turquoise
13. a. DIGASTRICUS, b. STERNOHYOIDEUS, and c. OMOHYOIDEUS \_\_\_\_\_ Yellow Green
14. a. STERNOCLEIDOMASTOIDEUS and b. TRAPEZIUS \_\_\_\_\_ Light Orange
15. SUPERIOR OBLIQUE \_\_\_\_\_ Gray
16. a. SUPERIOR, b. LATERAL, and c. MEDIAL RECTUS \_\_\_\_\_ Light Purple
17. TROCHLEA (pulley) \_\_\_\_\_ Dark Blue
18. INFERIOR OBLIQUE \_\_\_\_\_ Flesh



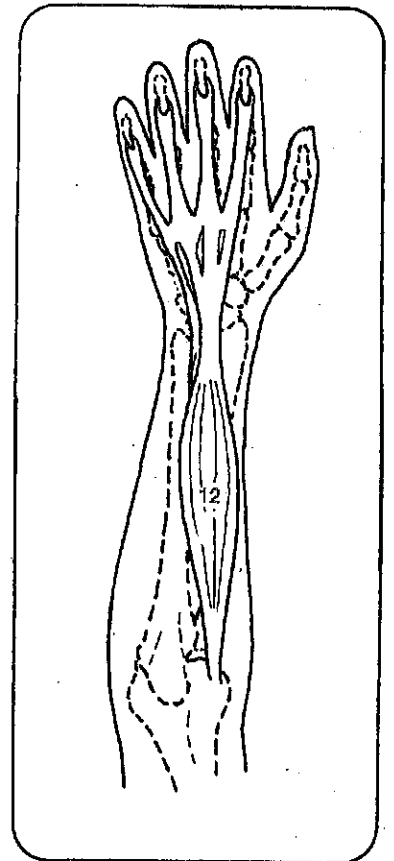
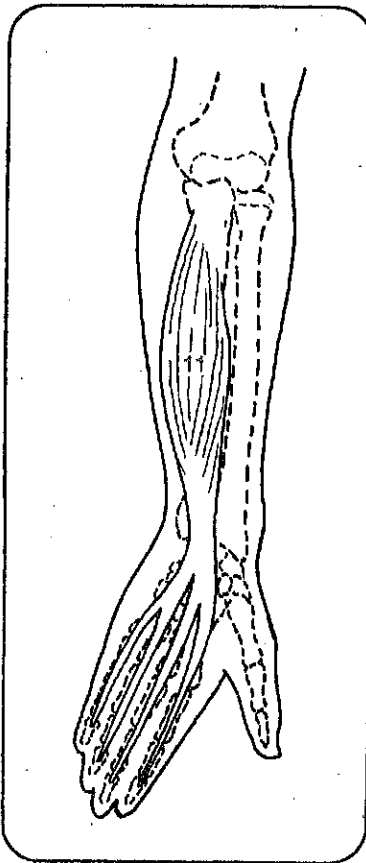
# MUSCLES OF THE UPPER LIMBS

A complex group of strong opposing muscles move the arm. These muscles, which arise from the scapula, clavicle, sternum, ribs, lower vertebrae, and hips, form the only attachment between the arm and shoulder and the axial skeleton and hold the humerus in its socket. By contracting and relaxing in combination, the shoulder muscles are able to rotate, extend, and flex the arm at the shoulder. The *brachialis*, *biceps brachii* (which has two heads or origins), and *triceps brachii* (three heads), all muscles of the upper arm, flex the elbow joint and move the forearm. The two rotating actions, *supination* (as

when you turn a key) and *pronation* (as in turning the palm down) are generated by muscles that arise in the humerus and wrap around the radius and ulna like a window shade around its roller. The forearm and lower humerus are the origin for the primary muscles of the wrist, hand, and fingers. The fingers are connected by long tendons, which you can see in the back of your hand, that run from the forearm muscles. Muscles on the underside of the forearm bend the fingers; muscles on the upper side extend them. The hand has small muscles that spread the fingers and perform the complex and very important appposable thumb action, which man alone among primates is capable of.



1. DELTOID \_\_\_\_\_ Orange
2. PECTORALIS MAJOR \_\_\_\_\_ Light Blue
3. TRICEPS \_\_\_\_\_ Pink
4. BICEPS \_\_\_\_\_ Green
5. BRACHIALIS \_\_\_\_\_ Light Brown
6. PRONATOR TERES \_\_\_\_\_ Gray
7. BRACHIORADIALIS \_\_\_\_\_ Light Purple
8. FLEXOR CARPI RADIALIS \_\_\_\_\_ Yellow
9. PALMARIS LONGUS \_\_\_\_\_ Turquoise
10. FLEXOR CARPI ULNARIS \_\_\_\_\_ Red
11. FLEXOR DIGITORUM SUPERFICIALIS \_\_\_\_\_ Light Green
12. EXTENSOR DIGITORUM and INDICIS \_\_\_\_\_ Light Orange



# SKELLETAL SYSTEM

Name: \_\_\_\_\_

The skeletal system in the adult consists of 206 bones and the strong elastic tissue that forms *ligaments*, *tendons*, and *cartilages*, which tie bones together and form the nose, larynx, trachea, bronchial tubes, and the outer ear. The skeleton provides a strong framework for the body, gives it its basic shape, and permits us to stand upright. The skeletal system also supports and restrains

soft internal organs and shields fragile organs such as the brain and lungs. Certain bones, connected by flexible joints, form a combination of levers that allow coordinated movement. Bones also provide a firm anchor for skeletal muscles and produce red blood cells in their marrow cavities.

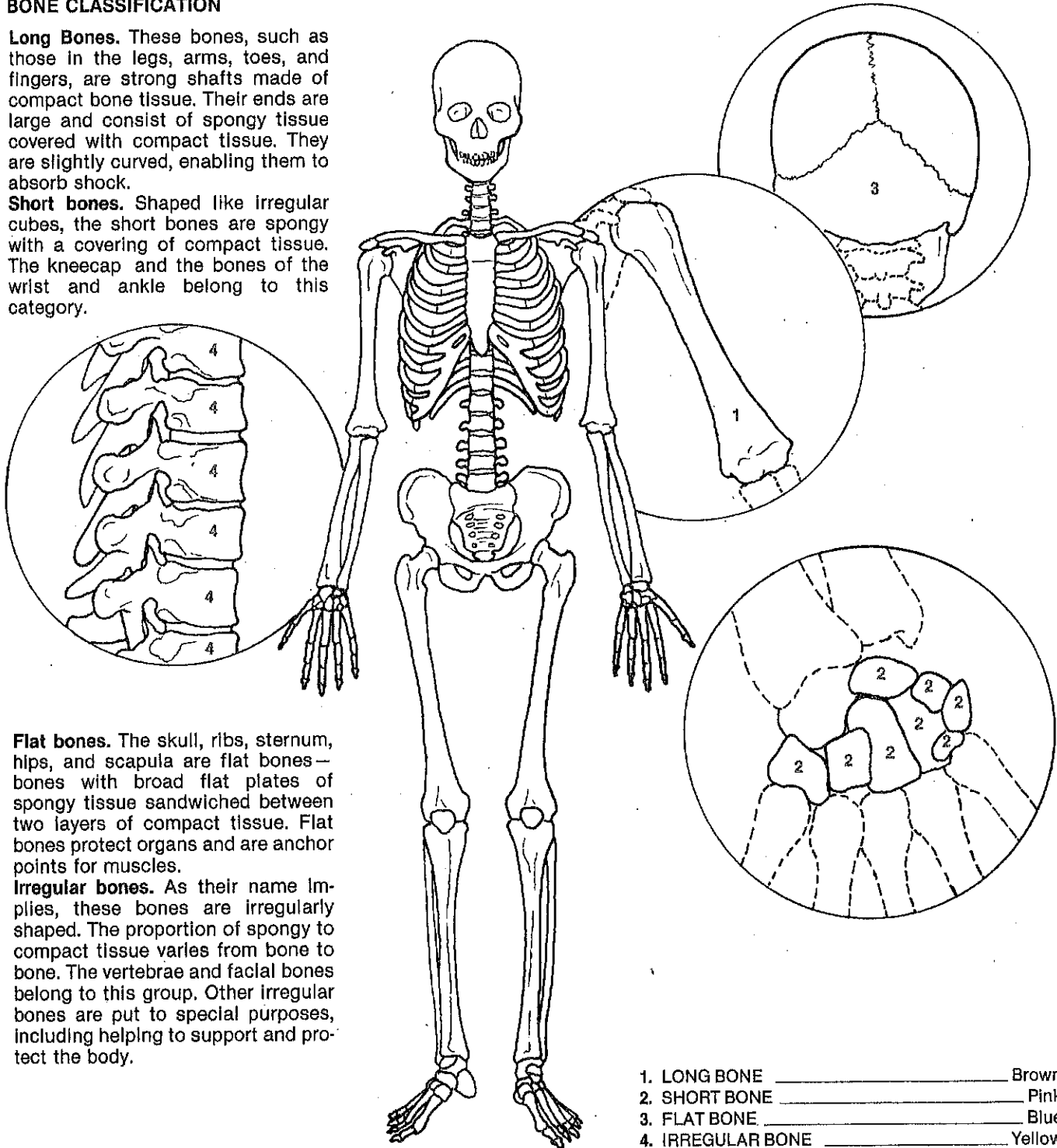
## BONE CLASSIFICATION

**Long Bones.** These bones, such as those in the legs, arms, toes, and fingers, are strong shafts made of compact bone tissue. Their ends are large and consist of spongy tissue covered with compact tissue. They are slightly curved, enabling them to absorb shock.

**Short bones.** Shaped like irregular cubes, the short bones are spongy with a covering of compact tissue. The kneecap and the bones of the wrist and ankle belong to this category.

**Flat bones.** The skull, ribs, sternum, hips, and scapula are flat bones—bones with broad flat plates of spongy tissue sandwiched between two layers of compact tissue. Flat bones protect organs and are anchor points for muscles.

**Irregular bones.** As their name implies, these bones are irregularly shaped. The proportion of spongy to compact tissue varies from bone to bone. The vertebrae and facial bones belong to this group. Other irregular bones are put to special purposes, including helping to support and protect the body.

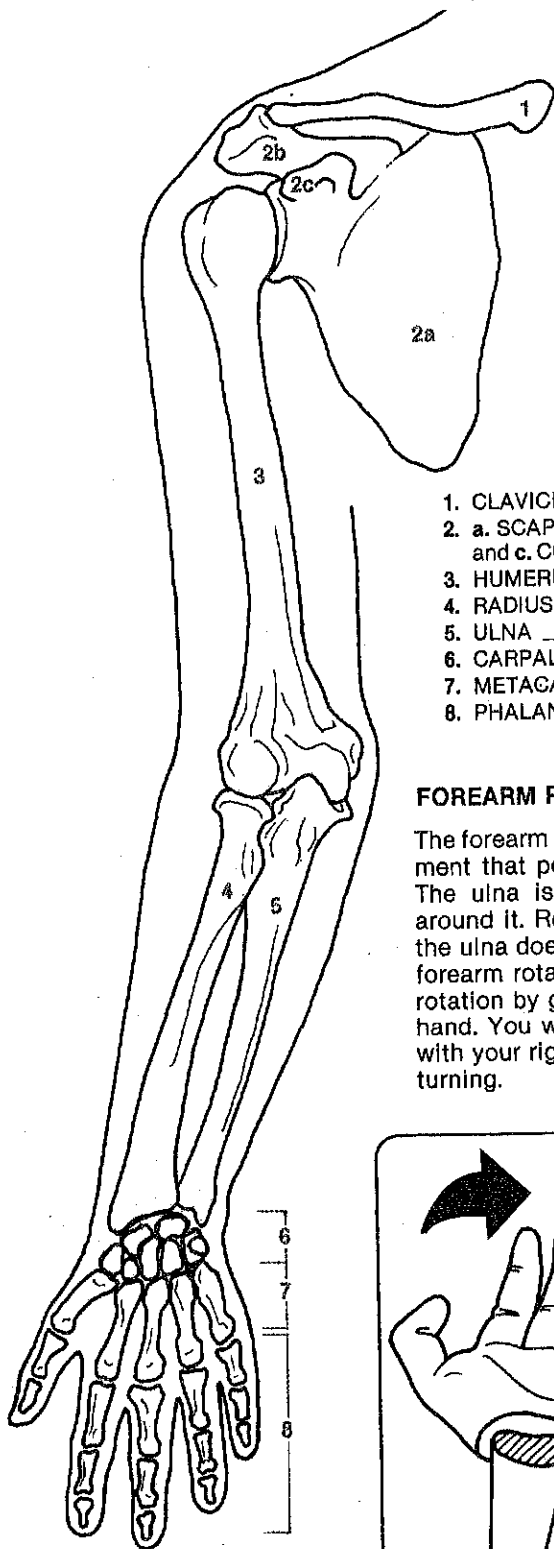


- 1. LONG BONE \_\_\_\_\_ Brown
- 2. SHORT BONE \_\_\_\_\_ Pink
- 3. FLAT BONE \_\_\_\_\_ Blue
- 4. IRREGULAR BONE \_\_\_\_\_ Yellow

# APPENDICULAR SKELETON — UPPER EXTREMITIES

The combination of simple joints and levers that make up the arm and hand produce an astounding range of movements — baseball pitchers and jewelers both employ the complex arm and hand for very different purposes. The arm is supported by the *pectoral girdle*, which consists of the *scapula* or shoulder blade and the *clavicle* or collar bone. The scapula is held in place only by muscles; hence it is free floating and capable of considerable movement.

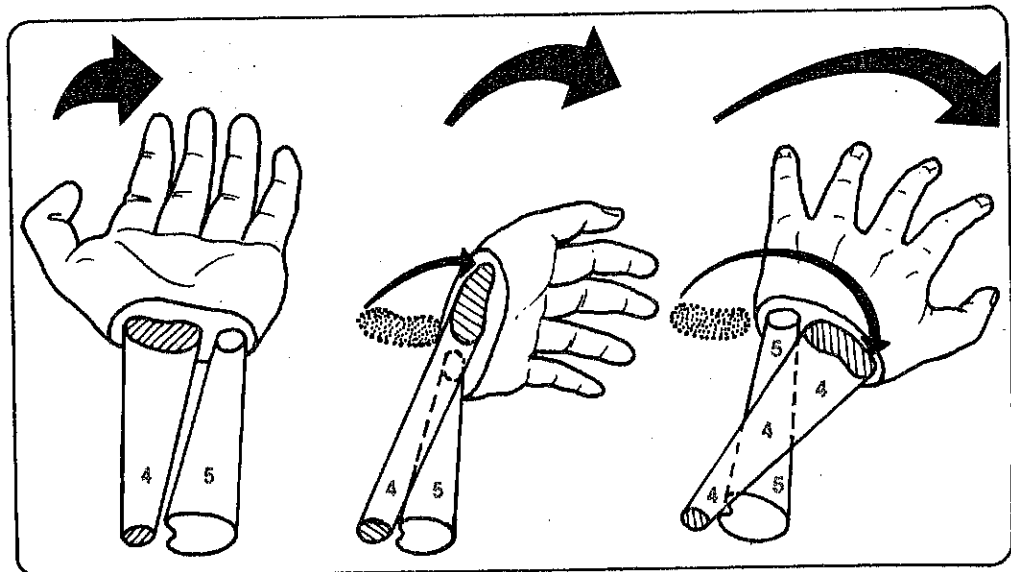
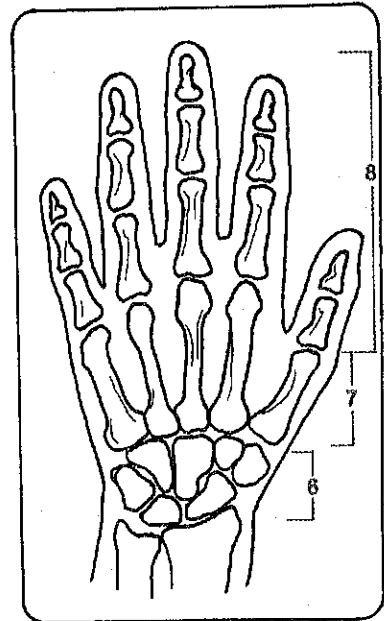
There is a ball at the top of the upper arm bone or *humerus* that rotates in a socket in the scapula. The forearm consists of the *ulna* and *radius*, which join the hand at the eight wrist bones or *carpals*; *intercarpal ligaments* tie the carpals together. The *metacarpals*, the five long bones that form the palm of the hand, join with the carpals. Beginning with the thumb, the metacarpals are numbered 1 to 5. The *knuckles* are the *heads* of the metacarpals. The finger bones or *phalanges* articulate with the metacarpals. Each finger has three bones, except for the thumb, which has two.



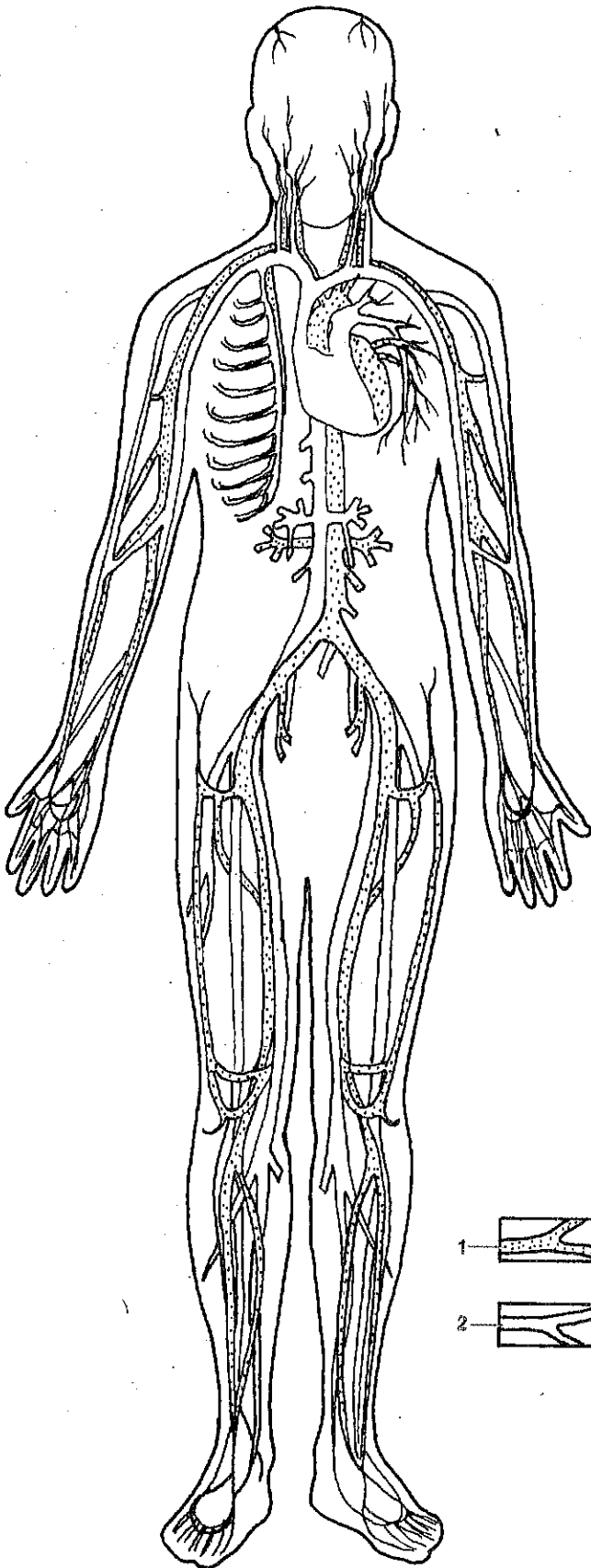
1. CLAVICLE \_\_\_\_\_ Green
2. a. SCAPULA, b. ACROMIAL PROCESS,  
and c. CORACOID PROCESS \_\_\_\_\_ Pink
3. HUMERUS \_\_\_\_\_ Purple
4. RADIUS \_\_\_\_\_ Turquoise
5. ULNA \_\_\_\_\_ Gray
6. CARPALS \_\_\_\_\_ Yellow
7. METACARPALS \_\_\_\_\_ Brown
8. PHALANGES \_\_\_\_\_ Blue

## FOREARM ROTATION

The forearm has an interesting mechanical arrangement that permits it to rotate and gives it power. The ulna is a stationary axle; the radius turns around it. Rotate your hand and you will see that the ulna doesn't move. To appreciate the power of forearm rotation, all you need do is try to prevent rotation by grasping your left wrist with your right hand. You will have to exert a great deal of force with your right hand to stop your left forearm from turning.

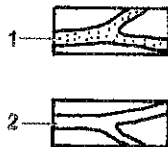


# CIRCULATORY SYSTEM



The circulatory system supplies oxygen and nutrients to every cell of the body and removes wastes and carbon dioxide. The system consists of *blood*, which carries the nutrients and wastes; the *heart*, which pumps the blood; and a closed system of tubes (*arteries* and *veins*) that carries the blood to and from the body tissues. The arteries transport blood enriched with oxygen and nutrients; the veins carry depleted blood. The artery that leaves the heart is very large, but it divides again and again into smaller and smaller branches. The tiniest of these branches are called *capillaries*, which are only seven to nine microns wide—so small that blood cells must pass through in single file. The capillaries are the site of the exchange of nutrients and wastes between the blood and the tissue cells. Interlacing capillary beds are found throughout the body except in the cartilages, cuticles, nails, hair, and the cornea of the eye. The depleted blood moves back toward the heart through the *venous system*. First the tiniest blood vessels unite in the capillary beds to form *venules*, then the venules combine again and again until they form the largest veins. The heart pumps the depleted blood to the lungs, where carbon dioxide is exchanged for oxygen, and to the liver and kidneys, which remove wastes.

Large arteries provide direct "express" service to major areas of the body such as the brain, lungs, arms, and abdomen; these arteries don't begin to subdivide until they reach the appropriate area. Press your finger against one of these arteries and you will feel the pump stroke or beat of the heart. This is the pulse.



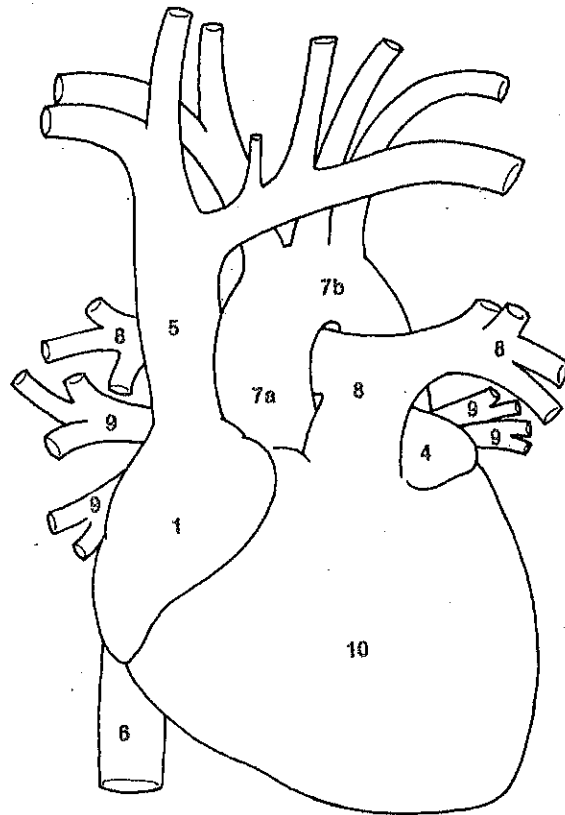
- 1. ARTERIAL CIRCULATION \_\_\_\_\_ Red
- 2. VENOUS CIRCULATION \_\_\_\_\_ Blue

# HEART

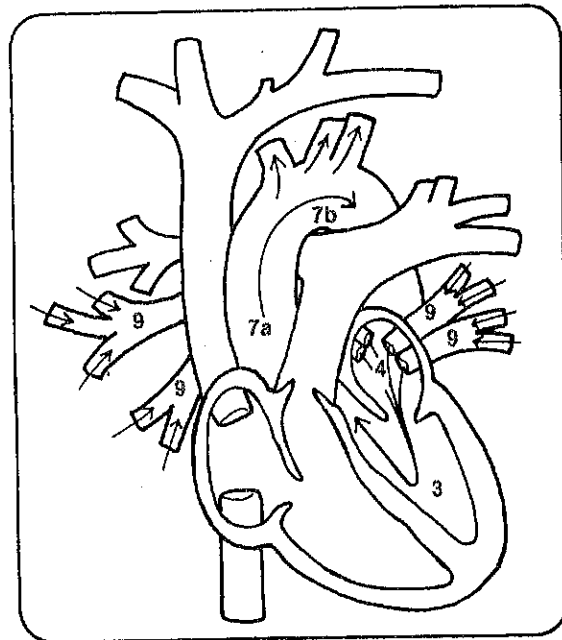
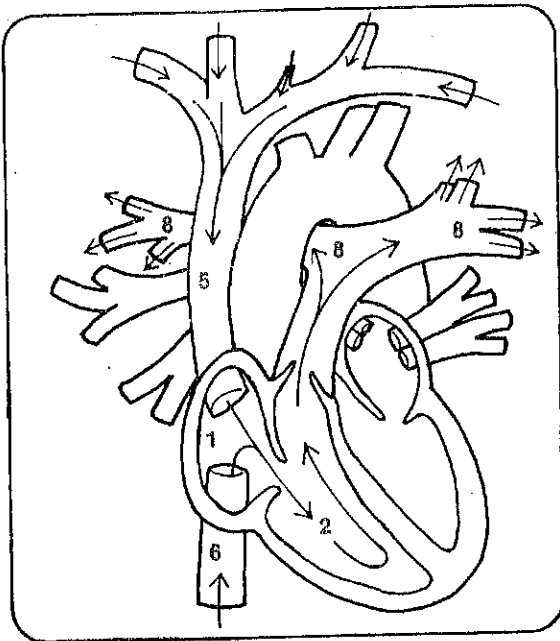
The heart is the key organ of the circulatory system. It is a bit larger than a man's fist — about twelve centimeters long, nine centimeters wide, and six centimeters thick. This hollow muscle is located to the left of the sternum between the second and fifth ribs and is enclosed in the *pericardium*, a membranous sac with a fibrous layer outside and a serous one inside, which protects the heart and anchors it in place. Between the two layers is a watery lubricant that minimizes friction when the heart beats. The heart is surrounded by the lungs, each of which has a notch, the *cardiac impression*, the heart fits into.

Each half of the heart has two chambers, the *atrium* (upper) and the *ventricle* (lower). Blood returning to the heart enters the right atrium from three veins: the *superior vena cava*, which runs from the upper torso and limbs; the *inferior vena cava*, which carries blood from the lower torso and limbs; and the *coronary sinus*, which circulates venous blood from the walls of the heart. The blood is pumped through the *tricuspid valve* (which has three cusps or flaps) into the right ventricle. From there it goes to the *pulmonary artery*, the only artery that carries unoxygenated blood, which carries it to the lungs. In the lungs the blood exchanges carbon dioxide for oxygen. The enriched blood then goes to the left atrium, where it passes through the strong *bicuspid* or *mitral valve* into the left ventricle. Finally the blood leaves the heart through the *aortic semilunar valves* and flows into the *aorta* and through the body.

The heart beats involuntarily, that is, the brain doesn't have to command it to pump blood. Instead various sensors monitor the body's activities and the consequent demands for more or less blood. For example, there are pressure receptors in the aorta that respond to changes in arterial pressure. The *aortic reflex* slows the heart when the pressure gets too high; the *carotid sinus reflex* increases the heart rate when the pressure becomes too low in the arteries that serve the brain. Chemoreceptors increase the heartbeat if they detect a lack of oxygen or an increase of carbon dioxide.

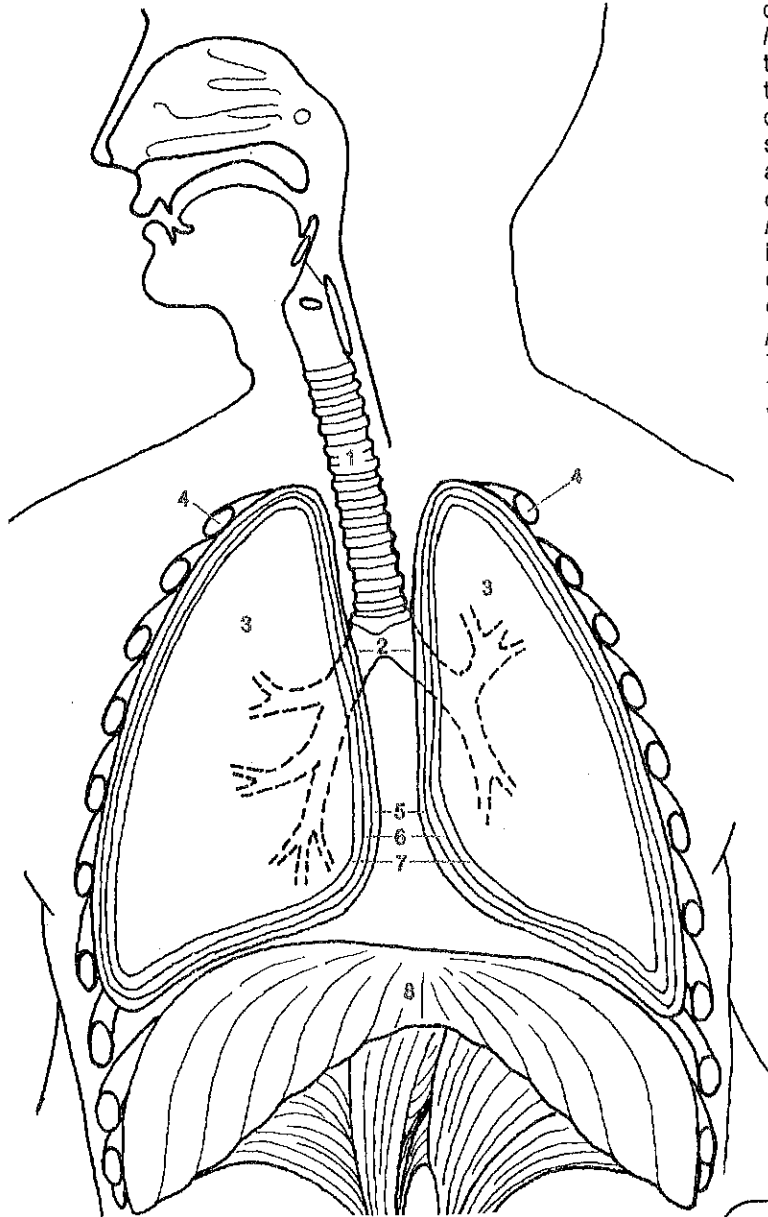


- |  |       |              |
|--|-------|--------------|
| 1. RIGHT ATRIUM                          | _____ | Light Purple |
| 2. RIGHT VENTRICLE                       | _____ | Blue         |
| 3. LEFT VENTRICLE                        | _____ | Red          |
| 4. LEFT ATRIUM                           | _____ | Orange       |
| 5. SUPERIOR VENA CAVA                    | _____ | Light Blue   |
| 6. INFERIOR VENA CAVA                    | _____ | Dark Blue    |
| 7. a. ASCENDING AORTA and b. AORTIC ARCH | _____ | Pink         |
| 8. PULMONARY ARTERY                      | _____ | Green        |
| 9. PULMONARY VEIN                        | _____ | Yellow       |
| 10. HEART                                | _____ | Purple       |



# RESPIRATORY SYSTEM

Every cell in the body converts oxygen to energy and generates carbon dioxide as a waste product. *Ventilation* is the term for the process of breathing oxygen in and carbon dioxide out. The respiratory system consists of the *nose*; *nasal cavities*, which filter and condition incoming air; the *pharynx* or throat; the *larynx* or voice box; the *trachea* or windpipe; the *lungs*; the *bronchi* or branching air tubes in the lungs; and the *air sacs*, the actual site of the oxygen-carbon dioxide exchange. The lungs are protected by the strong rib cage and, underneath, the diaphragm; they are surrounded by two serous membranes, the *visceral pleurae*. The lungs in turn surround the *mediastinum*, an interpleural space, that contains the heart in its pericardial sac and parts of the trachea, bronchi, esophagus, blood vessels, and nerves. The thoracic cavity is lined by a membrane called the *parietal pleura*; between it and the visceral pleurae is a potential space, the *intrapleural space*, containing only a thin fluid that acts as a lubricant for the pleurae, which thus slide frictionlessly as the lungs move. The lungs open their inner air chambers to the outside atmosphere; thus when the lungs are at rest the air pressure is the same inside and outside the body. As inhalation begins, the ribs, thoracic muscles, and diaphragm increase the size of the thoracic cavity, thereby lowering the air pressure in the lungs. The higher pressure outside the body then forces more air into the lungs to equalize the air pressure inside and outside. During exhalation the muscles and ribs compress the lungs, raising the air pressure inside until it exceeds the pressure outside — and the air rushes out.



1. TRACHEA \_\_\_\_\_ Blue
2. BRONCHUS \_\_\_\_\_ Light Blue
3. LUNG \_\_\_\_\_ Gray
4. RIB CAGE \_\_\_\_\_ Yellow
5. PARIETAL PLEURA \_\_\_\_\_ Pink
6. INTRAPLEURAL SPACE \_\_\_\_\_ Yellow-Green
7. VISCERAL PLEURA \_\_\_\_\_ Orange
8. DIAPHRAGM \_\_\_\_\_ Red
9. a. RIGHT SUPERIOR and  
b. LEFT SUPERIOR LOBES \_\_\_\_\_ Light Orange
10. RIGHT MIDDLE LOBE \_\_\_\_\_ Light Green
11. a. RIGHT INFERIOR and  
b. LEFT INFERIOR LOBES \_\_\_\_\_ Light Brown
12. HEART \_\_\_\_\_ Purple
13. LUBRICATING FLUID \_\_\_\_\_ Green

