The Anatomical Position

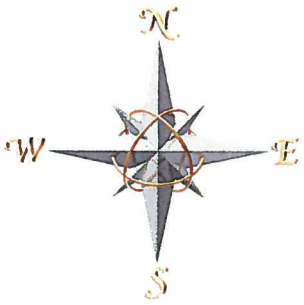
Every body of science has its own language and conventions. Anatomy and physiology are no different.

The **anatomical position** is a common starting point from which scientists view, describe, and analyze body parts and body movements. The anatomical position is used to describe the body in the same way a compass (north, south, east, and west) is used to indicate direction and location.

When demonstrating the anatomical position:

- The person is standing erect with his or her head, eyes, and toes pointing forward.
- The feet are together and the arms are slightly out to the side.
- The palms of the hands are facing forward.

From this fixed starting point, you can describe positions and movements in a way that will be understood by everyone.



The anatomical position is used to describe the locations of things on your body the way a compass is used to describe the locations of things in geography.

Describing Positions and Relationships

Here are some of the terms used to describe locations and relationships of body parts, starting from the anatomical position.

Anterior/Posterior

- **Anterior** refers to locations on the front of your body; **posterior** refers to locations on the back of your body. Your rectus abdominis muscle is anterior to your spine.

Superior/Inferior

- **Superior** means above, or towards your head; **inferior** means below, or towards your feet. Your nose is superior to your mouth while your chin is inferior to your mouth.

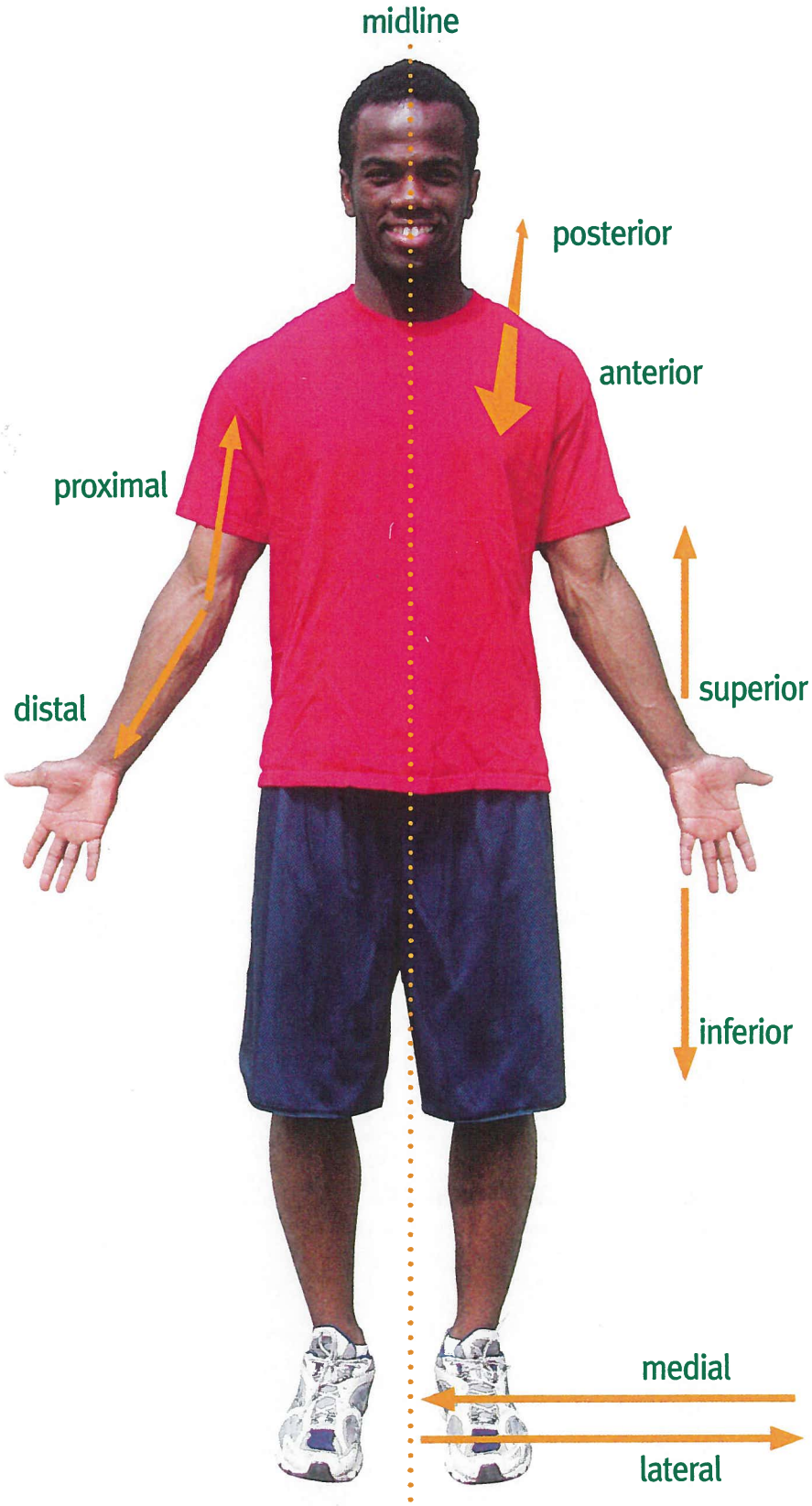
Medial/Lateral

- Something that is **medial** is closer to an imaginary line, called the midline, that divides your body in equal halves; **lateral** means something is farther from the midline. Your chest muscle is medial and your shoulder muscle is lateral.

Proximal/Distal

- **Proximal** refers to portions of limbs that are closer to your body; **distal** refers to parts and locations further from your body. Your foot is at the distal end of your leg, while your thigh is at the proximal end.

These are the basic terms of anatomy and physiology, and they will come up time and time again as you pursue your health and physical education studies. You should try to use these terms so they become second nature to you.



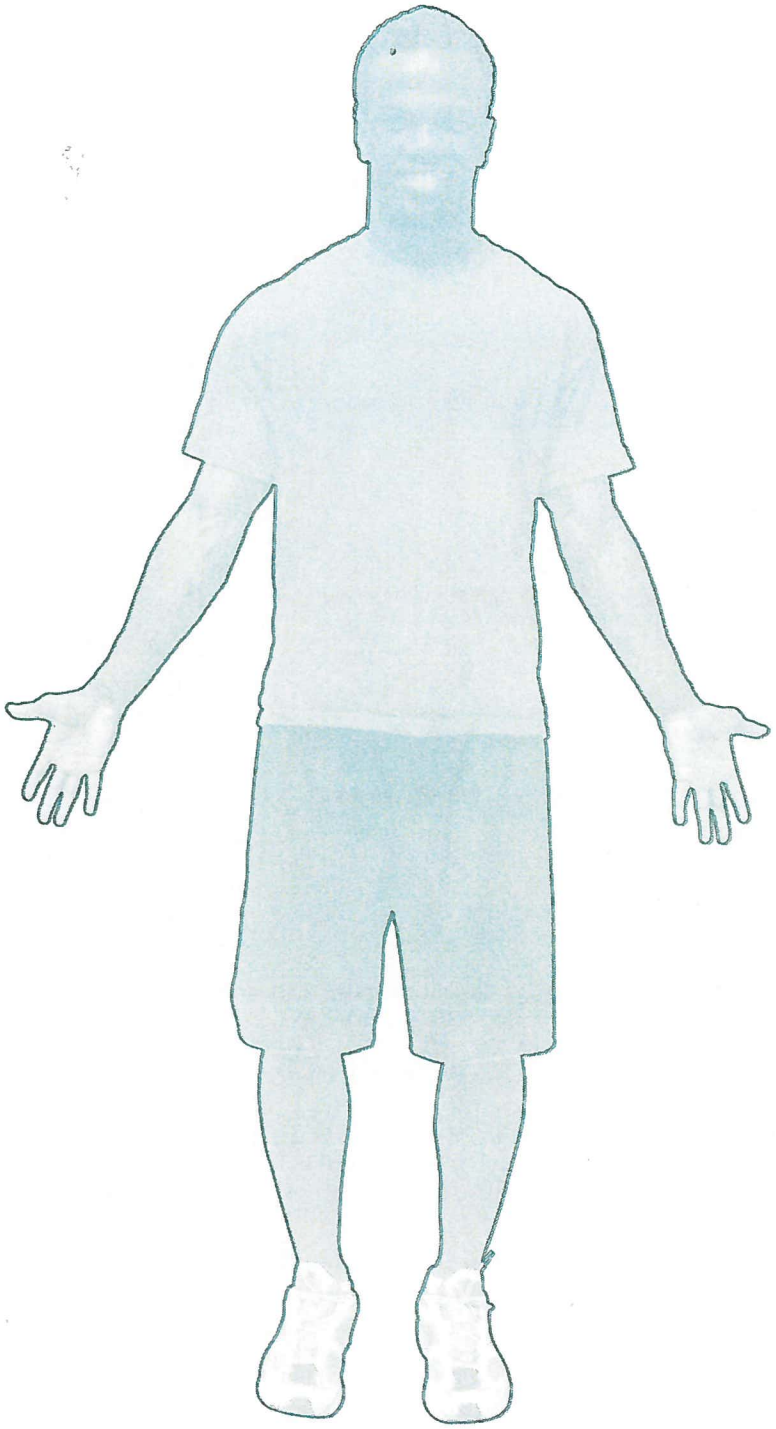
The anatomical position: A common starting point for describing positions and relationships.

Exercise 1.2

Anatomical Position

The anatomical position is a universally accepted starting point for describing body parts and body movement.

Mission: Draw arrows to label the diagram below using the terms on the right-hand side of this page.



Look in the Book
Page: 19

Student name:

Class/Period:

Date:

Assessed by:

- Teacher ☐
- Peer ☐
- Self ☐

- ☐ midline
- ☐ proximal
- ☐ posterior
- ☐ superior
- ☐ medial
- ☐ distal
- ☐ anterior
- ☐ inferior
- ☐ lateral

Anatomical Terms

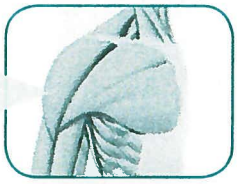
Anatomical terms are used to describe locations and relationships of body parts, starting from the anatomical position.

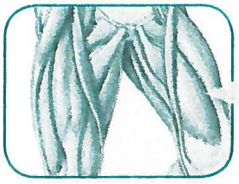
Mission: Place the anatomical terms below into the sentences that best describe their meaning.

superior distal inferior anterior
posterior medial lateral

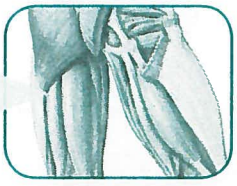
1. Your knee is _____ to your ankle.

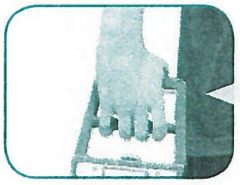
2. Your pectoralis major (chest muscle) is _____ to your deltoid muscle.



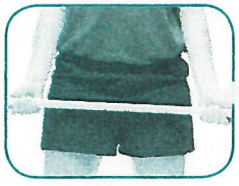


3. Your quadriceps muscles are _____ to your hamstring muscles.

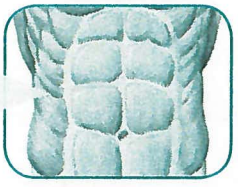


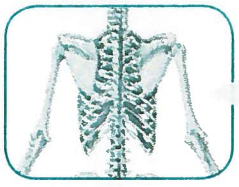


4. Your hand is at the _____ end of your arm.

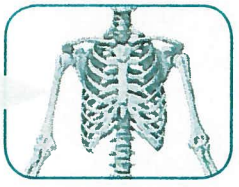


5. Your pelvis is _____ to your abdomen.





6. Your spine is _____ to your sternum.

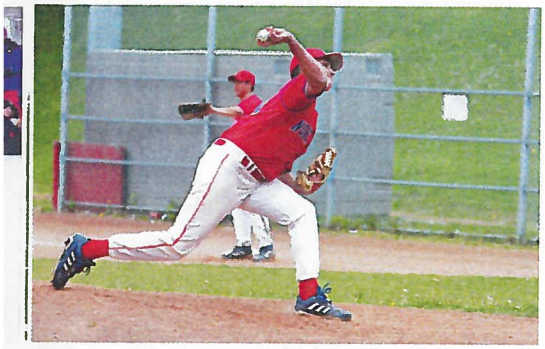


7. Your ears are _____ to your nose.

Describing Movement

Starting from the anatomical position, it is also possible to identify anatomical axes and anatomical planes. These are the imaginary lines and flat planes that are used to describe movement.

All forms of human movement can be described using the terms on this page.



Using correct anatomical terms can make describing position and movement much easier.

Anatomical Axes and Planes

Anatomical axes are imaginary lines around which rotation occurs. They skewer the body—horizontally, from back to front, and vertically. The three anatomical axes are:

- **Horizontal axis (bilateral axis).** This line passes laterally (from side to side) through the body. For example, a whole body rotation around this axis would be a forward or backward somersault.
- **Anteroposterior axis.** This line passes through the body from front to back. For example, a whole body rotation around this axis would produce a cartwheel.
- **Polar axis (vertical axis).** This line passes lengthwise (top to bottom) through the body. An example of a body rotation around this axis would be when a figure skater performs a spin.

Anatomical planes, on the other hand, are like sheets of glass placed through the body that show the dimension in which a movement occurs.

The three anatomical planes are:

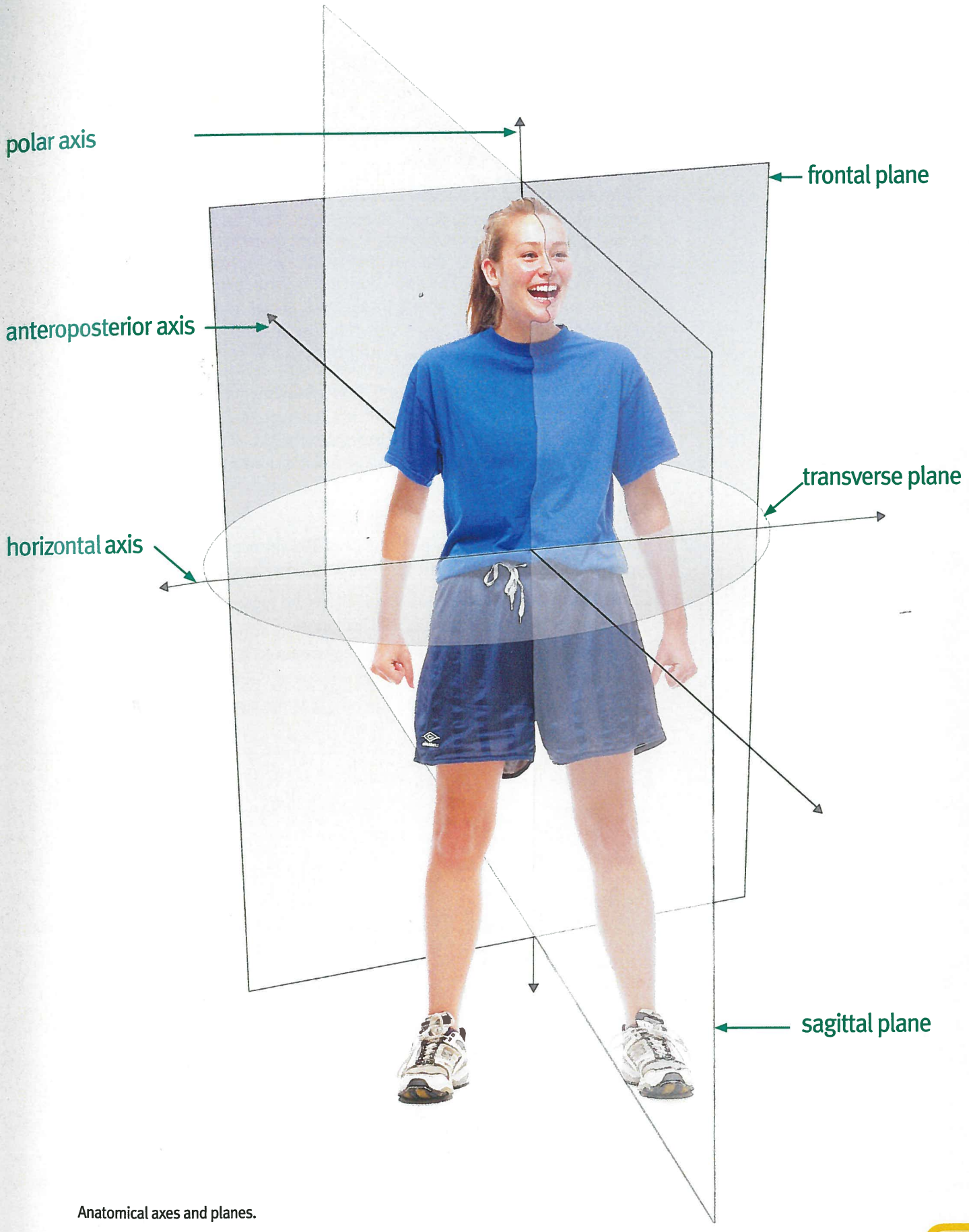
- **Sagittal plane.** This plane divides the body into right and left portions (side to side).
- **Frontal plane (coronal plane).** This plane divides the body into anterior and posterior portions (front to back).
- **Transverse plane (horizontal plane).** This plane divides the body into superior and inferior portions (top to bottom).

A Rule of Thumb

A good tip to remember is that the axes and planes are always at right angles to each other. Experiment with these terms and you will quickly discover how useful they are in allowing you to describe all forms of human movement.

The Relationship Between Axes and Planes

Axis of Rotation	Plane of Movement	Example
Horizontal	Sagittal	Flexing your biceps
Polar	Transverse	Figure-skater's spin
Anteroposterior	Frontal	Jumping jacks



Anatomical axes and planes.

Exercise 1.2

Anatomical Axes & Planes

Look in the Book
Pages: 20–21

Student name:

Class/Period:

Date:

Assessed by:

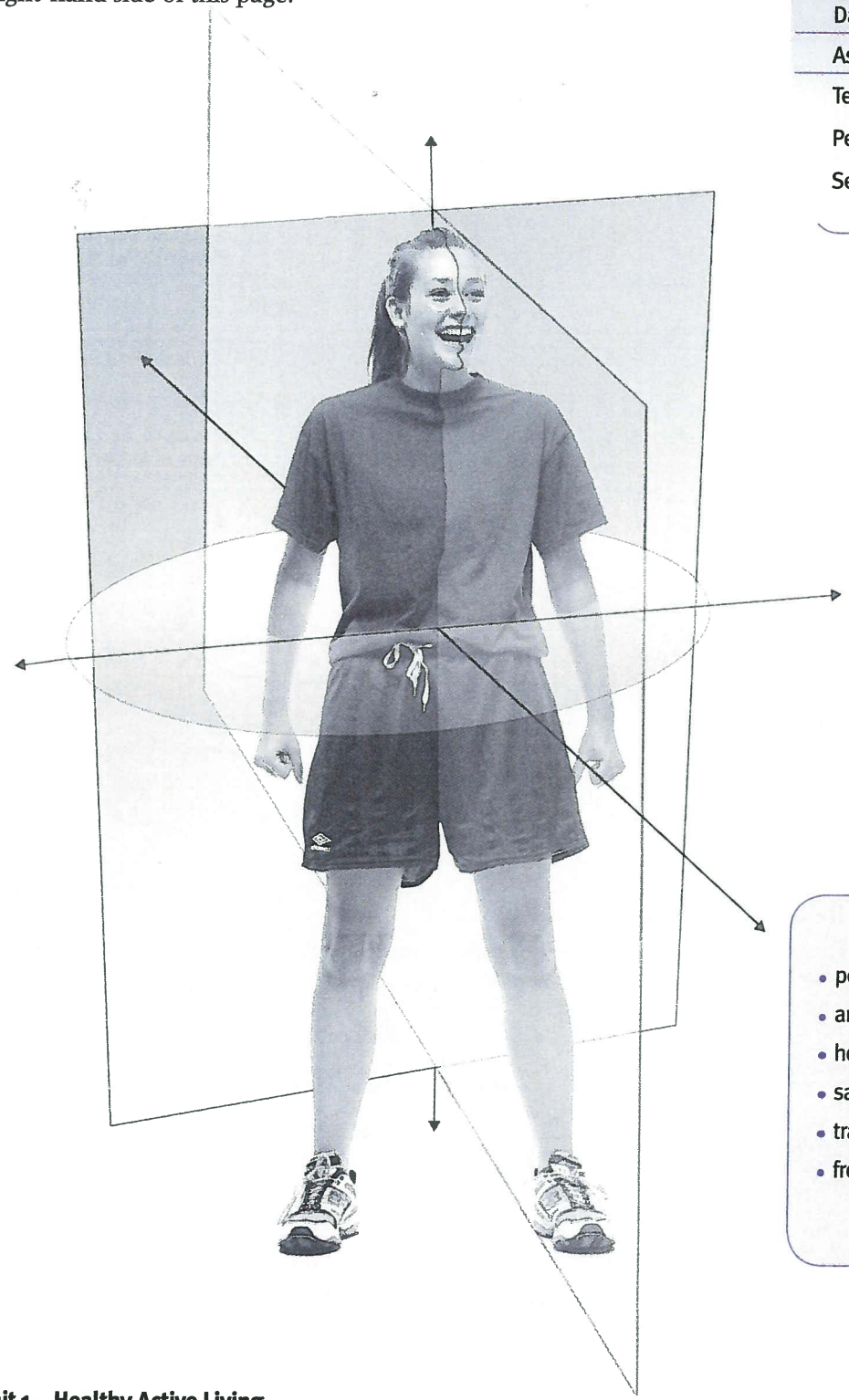
Teacher ☐

Peer ☐

Self ☐

Anatomical axes and planes are the imaginary lines and flat planes that are used to describe movement.

Mission: Label the anatomical axes and planes using the terms on the right-hand side of this page.



- polar axis
- anteroposterior axis
- horizontal axis
- sagittal plane
- transverse plane
- frontal plane

The Relationship Between Axes and Planes

Axes and planes are always at right angles to each other. Remembering this rule can make describing position and movement much easier.

Mission: Describe the form of movement occurring in the examples provided below, by filling in the axis of rotation in relation to the plane of movement.

horizontal axis **anteroposterior axis** **polar axis**

sagittal plane **frontal plane** **transverse plane**

Flexing biceps

Example

Axis of Rotation: Horizontal

Plane of Movement: Sagittal

Twirl (360° turn)

Axis of Rotation:

Plane of Movement:

Forward step (walking/running)

Axis of Rotation:

Plane of Movement:

Jumping rope

Axis of Rotation:

Plane of Movement:

Jump shot (basketball)

Axis of Rotation:

Plane of Movement:

Somersault

Axis of Rotation:

Plane of Movement:

The Skeletal System

We are born with more than 300 bones. As we get older, many of these bones join or fuse together to form 206 bones. Our bones account for approximately 14 to 20 percent of our total body weight.

The Parts of the Skeleton

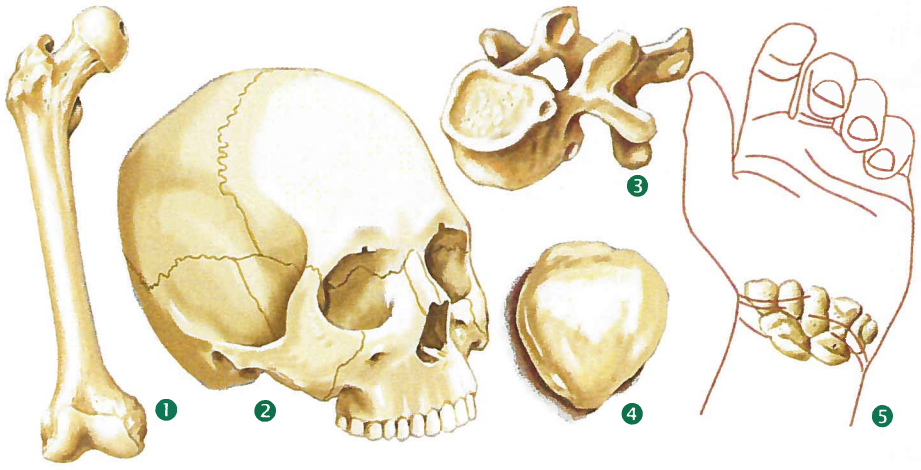
The skeleton can be divided into two major segments or parts: the axial skeleton and the appendicular skeleton. The illustrations on pages 24 and 25 illustrate these two divisions.

- **Axial skeleton.** The axial skeleton is similar to the frame of a car in that all the major parts are attached and connect to it. It consists of 80 bones which are located in the skull, spinal column, sternum, rib cage, and the sacrum.
- **Appendicular skeleton.** The appendicular skeleton consists of the bones that connect to the axial skeleton, the way doors do on a car's frame. It consists of 126 bones found in the arms, shoulder blades, forearms, hands, pelvic girdle, legs, and feet.

Types of Bones

Bones come in many shapes and sizes. Below is a breakdown of the types of bones and where they can be found in the body.

1. **Long bones** are found in the arms and legs. The femur in your upper leg is an example of a long bone.
2. **Flat bones**, as the name implies, are flat. The individual bones in the roof of your skull are examples of flat bones.
3. **Irregular bones** include the bones of the vertebrae.
4. **Sesamoid bones** are small, flat bones wrapped within tendons. The patella (kneecap) is the largest sesamoid bone in the body.
5. **Short bones** are found in the wrists and ankles. The carpal bones in your wrists are examples of short bones.



Types of bones.

The Role of the Skeleton

The skeletal system has many important roles. Four important functions of the human skeleton are:

- **Support and movement.** The skeleton provides a frame to which our muscles and organs attach.
- **Protection.** The skeleton is the body's armour. For example, your skull protects your brain and your rib cage protects your lungs and heart.
- **Blood cell factory.** Our bone marrow creates our blood cells.
- **Warehouse.** Bones store minerals such as calcium and phosphate, which are essential for bone formation.

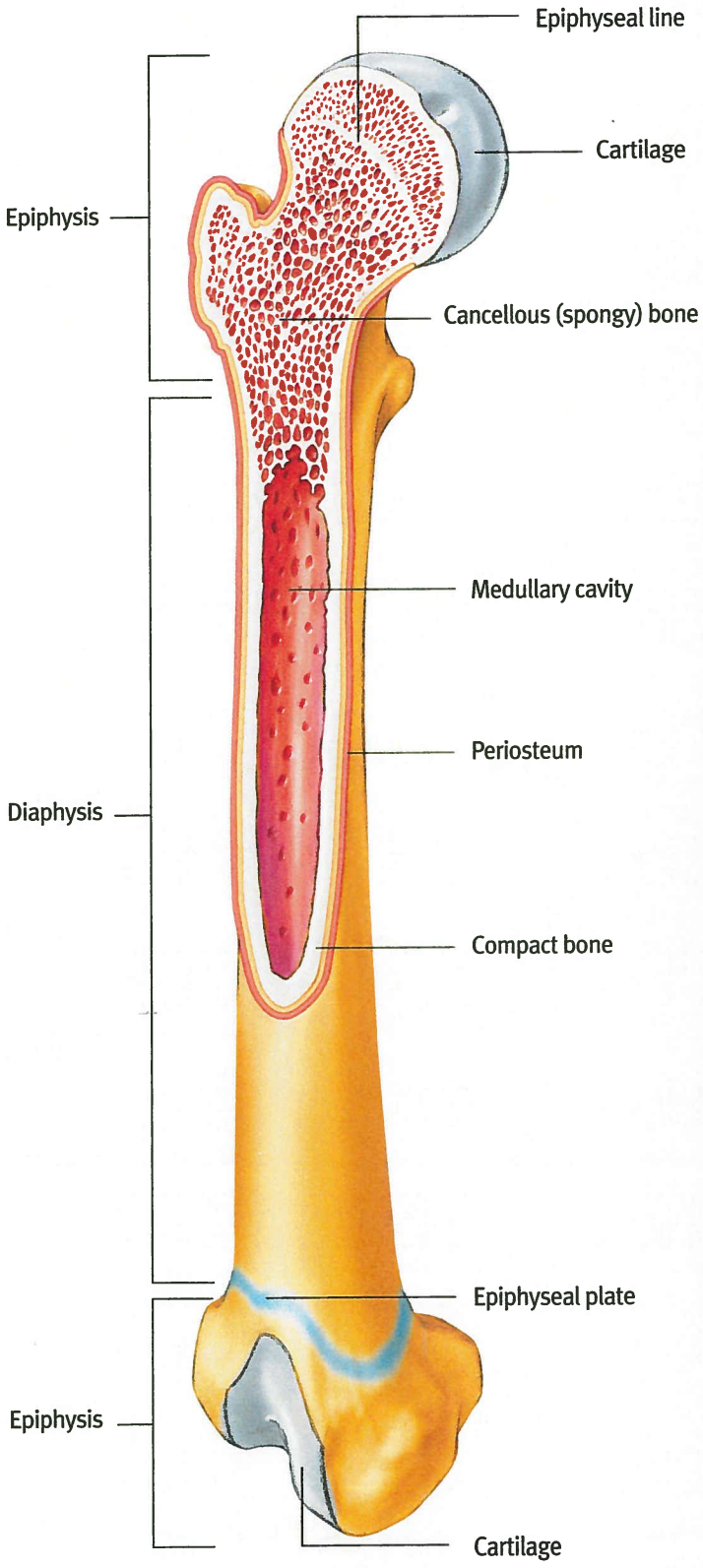
The Anatomy of a Long Bone
Built Tough

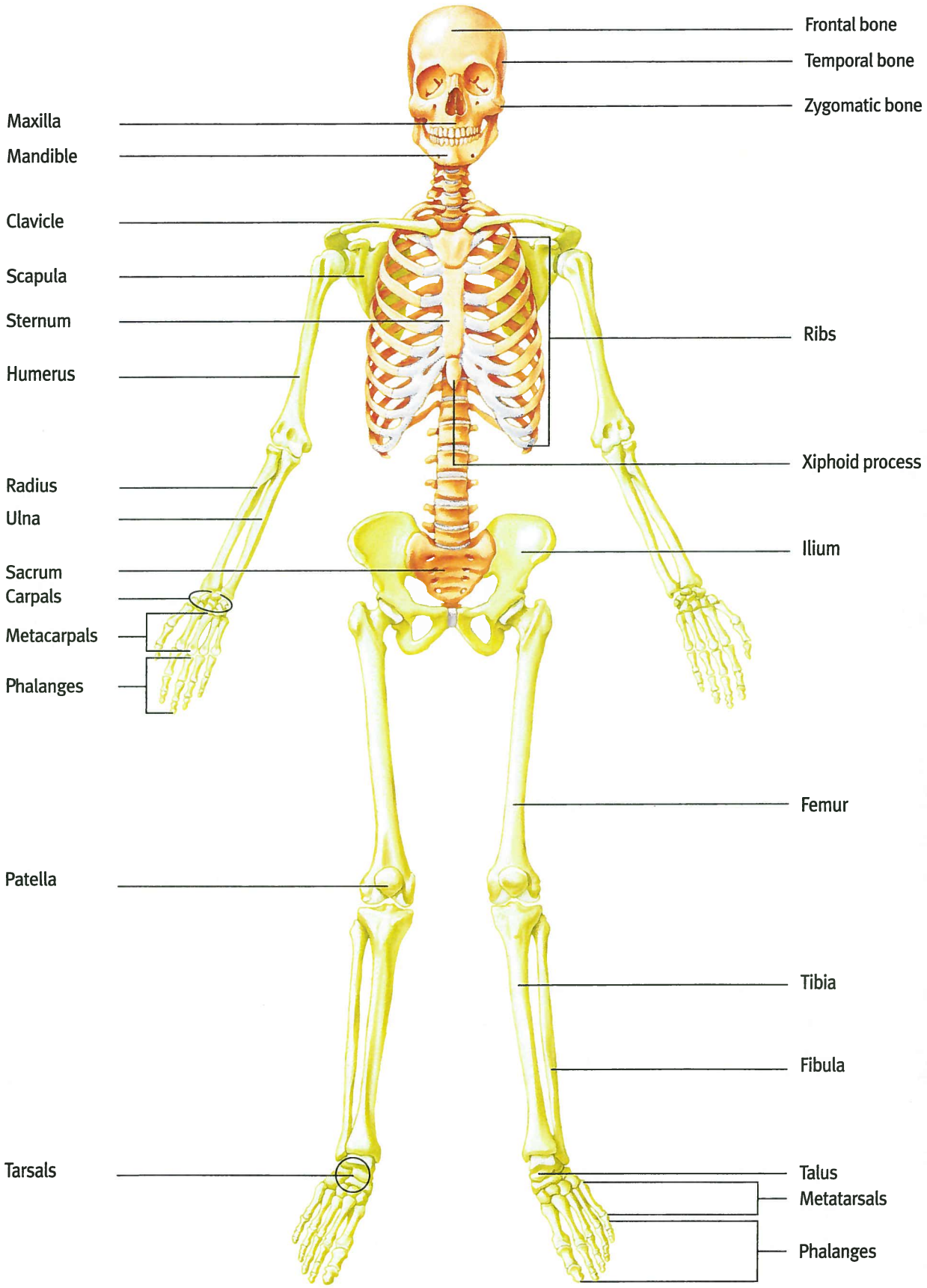
Bones are very strong. In fact, in a lab test, the tibia bone, located in the lower leg, was able to support 900 kg without breaking.

Examining some of the key components of bones will give us an understanding of the factors that contribute to this strength and durability.

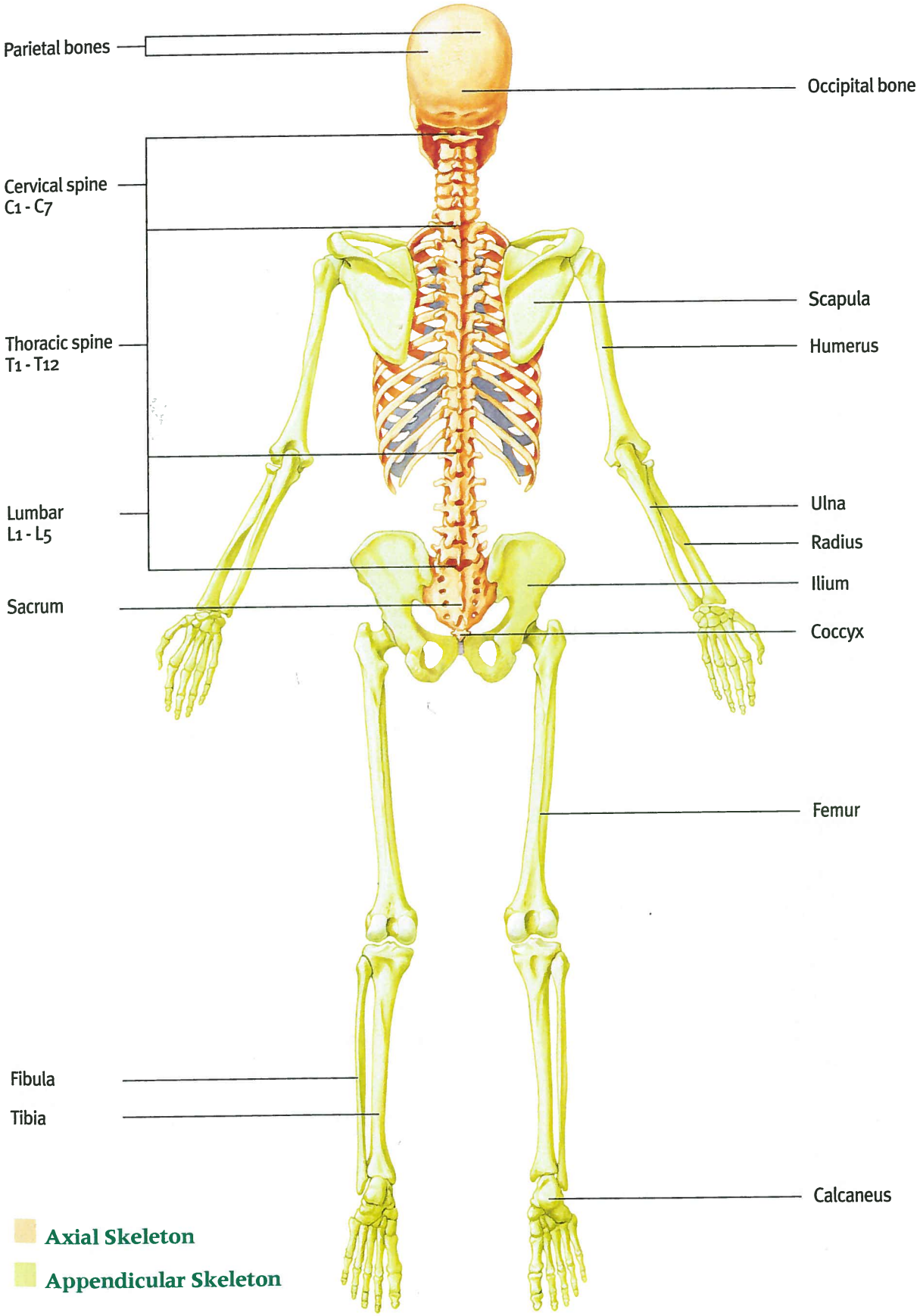
The following is a list of the main structures of bone:

- **Cartilage** is located on both ends of long bones and is referred to as articulating cartilage. It allows smooth movement (articulation) within joints while protecting the ends of bones.
- The **periosteum** is the connective tissue that covers the entire length of the bone. Ligaments and tendons connect to bone through this lining.
- The **diaphysis** is the name given to the shaft of a long bone.
- The **medullary cavity** is found inside the bone shaft and contains bone marrow: red marrow (where blood cells are made) and yellow marrow (which is mostly made of fat cells). Generally, children have a higher concentration of red marrow in their long bones, and as they grow into adulthood, it changes to yellow marrow.
- **Compact bone** is a dense part of the bone, which is responsible for the bone's strength. Compact bone is thickest along the diaphysis.
- **Cancellous, or spongy bone**, has many honeycomb-like spaces which are filled with marrow. Cancellous bone will strengthen with resistance exercise, such as weightlifting.
- The **epiphysis** is located at the end of the diaphysis. The outer surface of the epiphysis articulates (moves) with other bones.
- **Epiphyseal plates**, commonly called "growth plates" are the site of growth. If they are not present, growth has stopped and epiphyseal lines appear. Next time you have an X-ray done on a long bone ask your doctor to see if she or he can show you these plates or lines.





Anterior view of the human skeleton.



Posterior view of the human skeleton.

Exercise 1.3

Human Skeleton (Anterior)

Look in the Book
Pages: 24–25

Student name:

Class/Period:

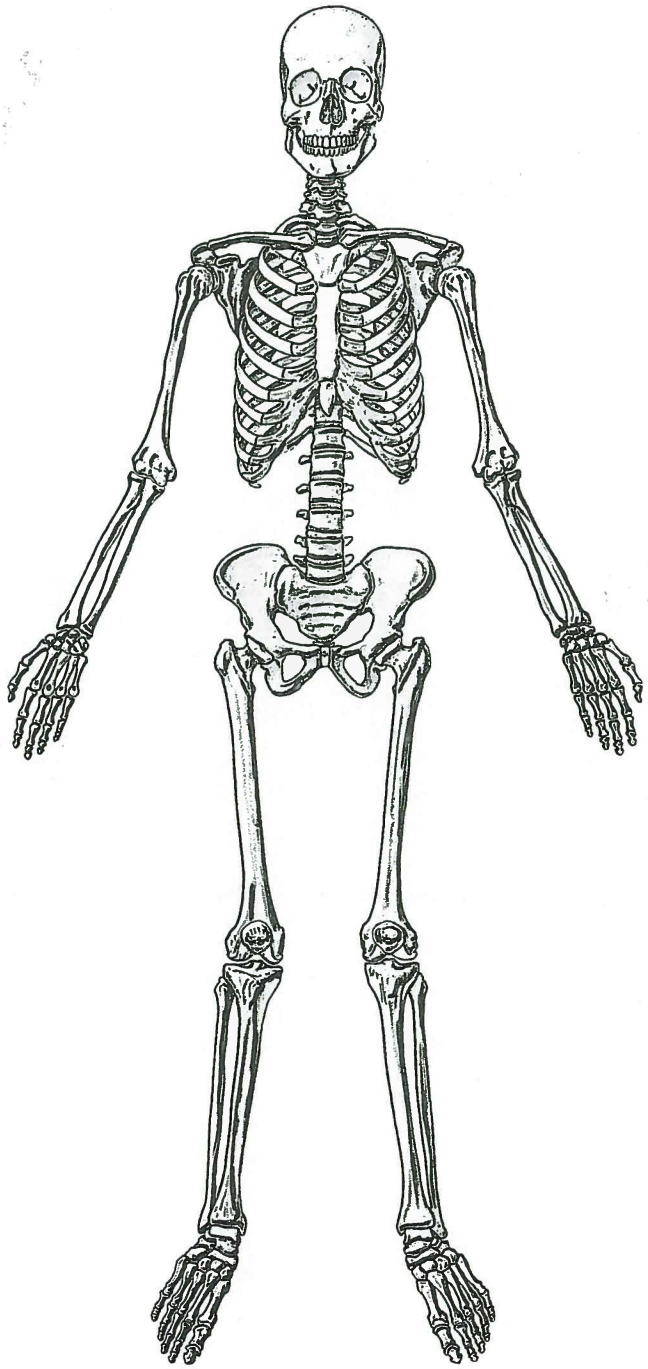
Date:

Assessed by:

Teacher ☐
Peer ☐
Self ☐

This exercise will help you become more familiar with the names of the major bones.

Mission: Use a different coloured pencil crayon to colour each word on the right-hand side of the page. Then use the same colour to identify the corresponding bone on the anterior skeleton below.

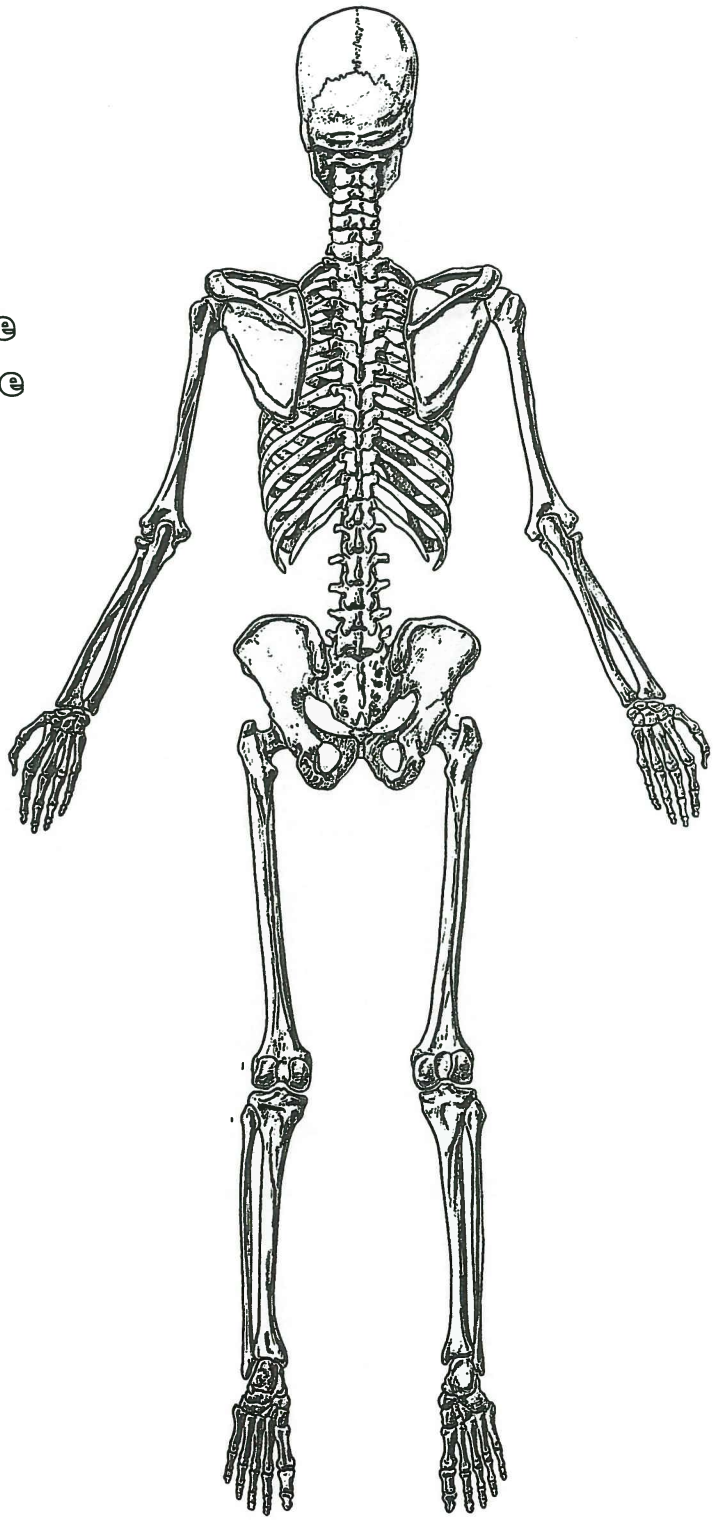


- ☐ Mandible
- ☐ Clavicle
- ☐ Scapula
- ☐ Sternum
- ☐ Humerus
- ☐ Radius
- ☐ Ulna
- ☐ Sacrum
- ☐ Carpals
- ☐ Metacarpals
- ☐ Phalanges
- ☐ Patella
- ☐ Xiphoid Process
- ☐ Ribs
- ☐ Femur
- ☐ Tibia
- ☐ Fibula
- ☐ Metatarsals

Human Skeleton (Posterior)

Mission: Use a different coloured pencil crayon to colour each word on the left-hand side of the page. Use the same colour to identify the corresponding bone on the posterior skeleton below.

- ☐ Cervical Spine
- ☐ Thoracic Spine
- ☐ Lumbar
- ☐ Sacrum
- ☐ Fibula
- ☐ Tibia
- ☐ Scapula
- ☐ Humerus
- ☐ Ulna
- ☐ Radius
- ☐ Coccyx
- ☐ Femur
- ☐ Calcaneus



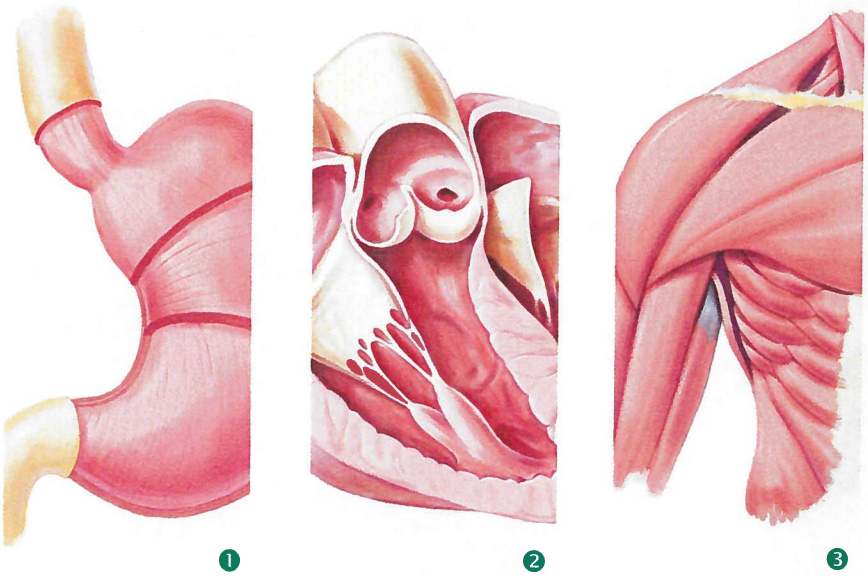
The Muscular System

Our bodies have over 600 muscles, which together make up half of our body weight. We use muscles in all kinds of ways, from performing athletic skills, to eating, talking, and dancing. Muscles burn plenty of calories both when they are being used and when they are resting, and they burn even more when they are "in shape."

Muscle Types

There are three major muscle types. Each type has distinct characteristics and functions, as listed below.

- **Smooth muscles** are involuntary and contract automatically. The central nervous system adjusts its contraction as required. These muscles do not tire easily and can stay contracted for a long period of time. This is important because the walls of our esophagus, stomach, intestines, and blood vessels are composed of smooth muscle.
- **Cardiac muscle**, as the name implies, is the specialized muscle tissue that comprises the heart. It is also involuntary. (Certain people— for example, deep-sea divers—can lower their heart rates to very low levels, which helps them adapt to underwater conditions.)
- **Skeletal muscles** are connected to bones by tendons. They are voluntary, meaning that we have control of them. Skeletal muscles are the engines that pull on bones, causing joints to move.



Types of muscle: ❶ Smooth muscle ❷ Cardiac muscle ❸ Skeletal muscle

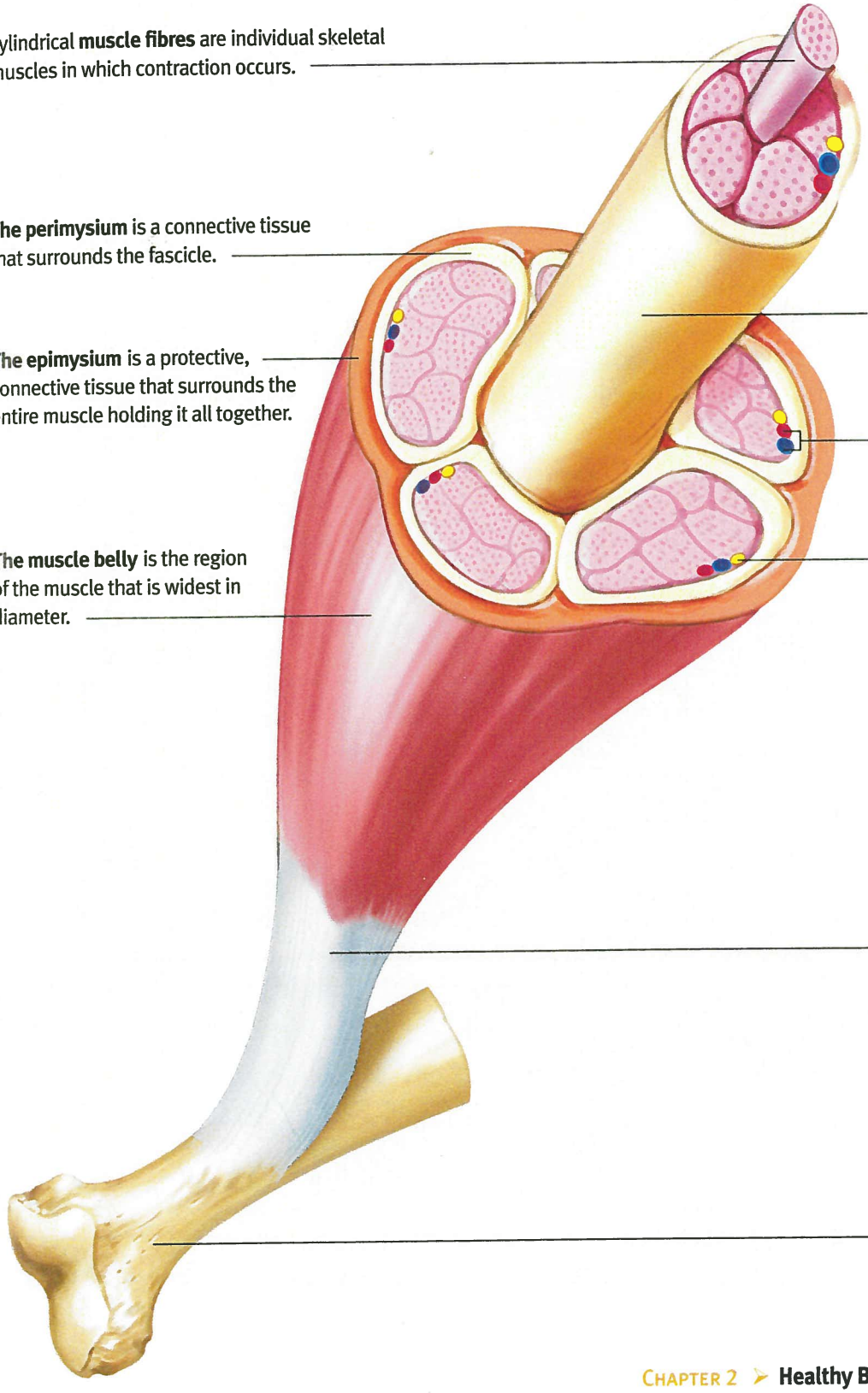
Muscle Maintenance

Having fit muscles helps to make everyday tasks easier. Here are some ways to take care of your muscles:

- **Exercise.** If muscles are not exercised regularly they will atrophy (or shrink).
- **Nutrition.** Eating properly from a variety of food sources (as outlined in *Canada's Food Guide to Healthy Eating*) will help keep muscles healthy.
- **Rest.** Each time you work out, especially with weights, you cause microscopic tears in your muscles. Rest is needed to avoid over-use injuries that can take weeks or even months to heal.

Having fit muscles also strengthens your joints by increasing their stability. As an added bonus, this increased stability can reduce your risk of joint injury.

The Composition of Skeletal Muscle
Bundles within Bundles within Bundles



Cylindrical **muscle fibres** are individual skeletal muscles in which contraction occurs.

The perimysium is a connective tissue that surrounds the fascicle.

The epimysium is a protective, connective tissue that surrounds the entire muscle holding it all together.

The muscle belly is the region of the muscle that is widest in diameter.

A fascicle contains a bundle of muscle fibres.

Blood vessels supply nourishment to and remove waste from muscle.

Nerve cells are communication agents between the brain and the muscle.

Tendons anchor and attach muscle to bone. When muscle contracts, it pulls on the tendon, causing movement of the bone.

Bone

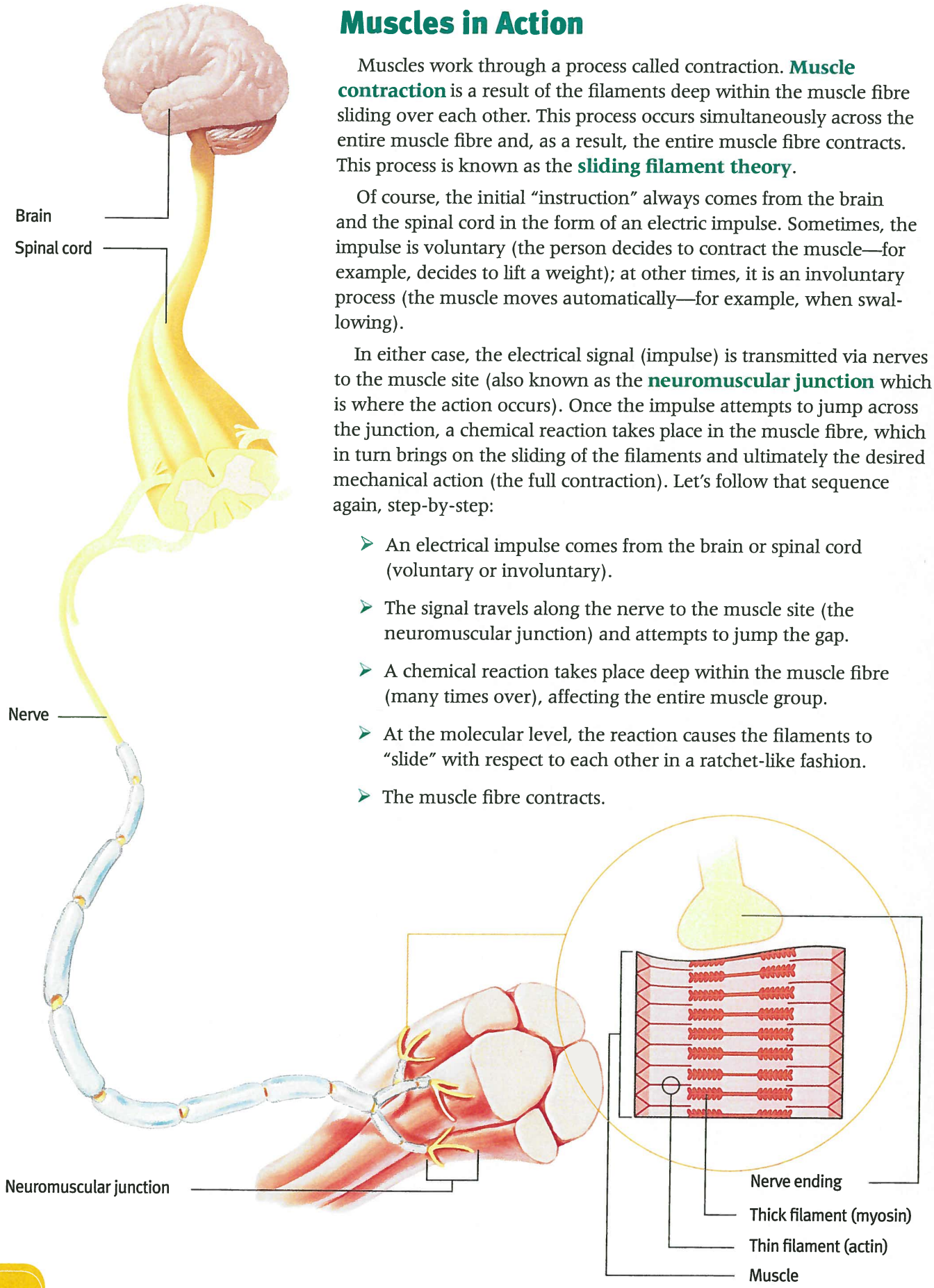
Muscles in Action

Muscles work through a process called contraction. **Muscle contraction** is a result of the filaments deep within the muscle fibre sliding over each other. This process occurs simultaneously across the entire muscle fibre and, as a result, the entire muscle fibre contracts. This process is known as the **sliding filament theory**.

Of course, the initial "instruction" always comes from the brain and the spinal cord in the form of an electric impulse. Sometimes, the impulse is voluntary (the person decides to contract the muscle—for example, decides to lift a weight); at other times, it is an involuntary process (the muscle moves automatically—for example, when swallowing).

In either case, the electrical signal (impulse) is transmitted via nerves to the muscle site (also known as the **neuromuscular junction** which is where the action occurs). Once the impulse attempts to jump across the junction, a chemical reaction takes place in the muscle fibre, which in turn brings on the sliding of the filaments and ultimately the desired mechanical action (the full contraction). Let's follow that sequence again, step-by-step:

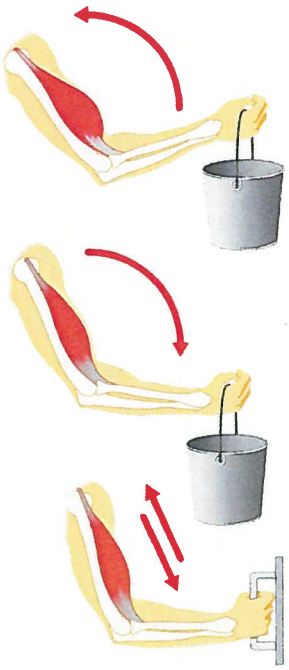
- An electrical impulse comes from the brain or spinal cord (voluntary or involuntary).
- The signal travels along the nerve to the muscle site (the neuromuscular junction) and attempts to jump the gap.
- A chemical reaction takes place deep within the muscle fibre (many times over), affecting the entire muscle group.
- At the molecular level, the reaction causes the filaments to "slide" with respect to each other in a ratchet-like fashion.
- The muscle fibre contracts.



Types of Muscle Contraction
Concentric, Eccentric, and Isometric

The main function of skeletal muscle is to get our skeletons moving through a process called contraction. There are three types of contraction. Understanding these contraction types will help you use them in your resistance and fitness programs.

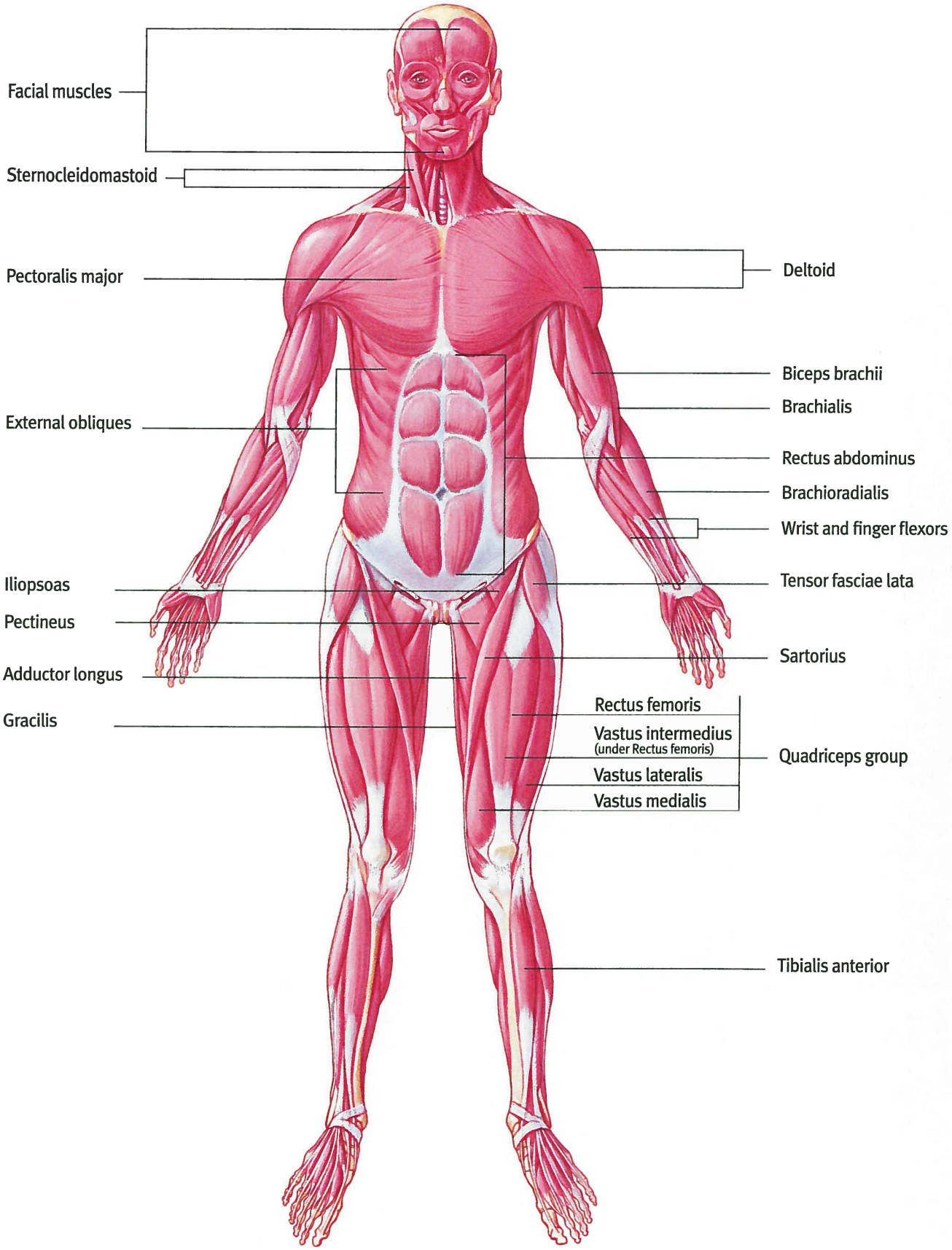
- **Concentric contraction** occurs when your muscle shortens while working. To see it in action, bend your elbow and watch what happens to your biceps muscle. You will notice that it has rolled up into a ball as it contracts.
- **Eccentric contraction** is the opposite of a concentric contraction. It occurs when your muscle lengthens while working. To see it in action, fully flex your elbow and then slowly straighten out your arm. This slow, controlled movement is the result of the biceps muscle lengthening.
- **Isometric contraction** occurs when a muscle force is equal to resistance and the muscle doesn't change in length. For example, as you push or pull against an immovable object, such as a wall, your muscles will contract but they will stay the same length.



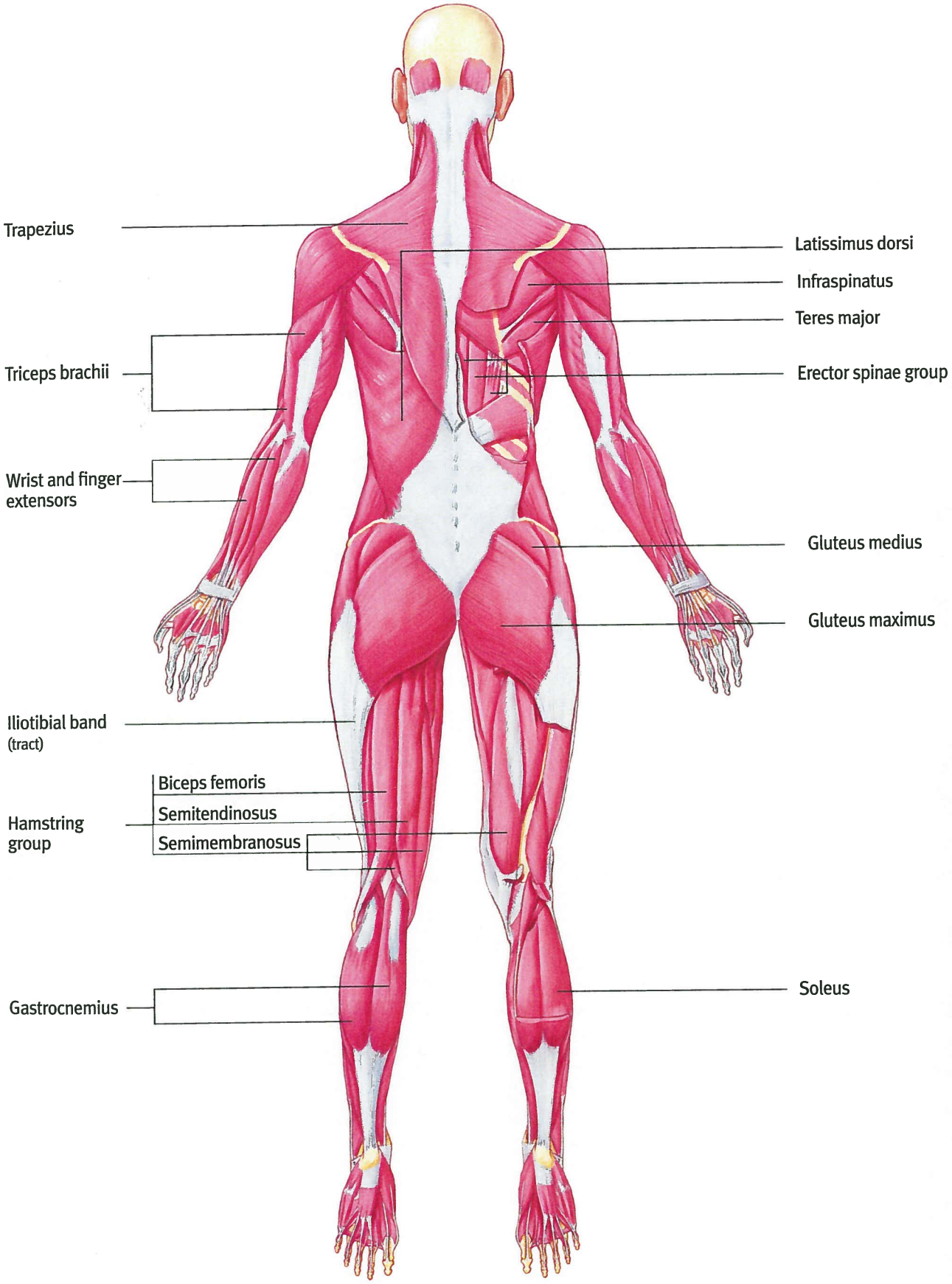
CONCENTRIC CONTRACTION

ECCENTRIC CONTRACTION

ISOMETRIC CONTRACTION



Anterior view of the muscular system.



Posterior view of the muscular system.

Exercise 1.4

Major Muscles (Anterior)

Look in the Book
Pages: 30–31

Student name:

Class/Period:

Date:

Assessed by:

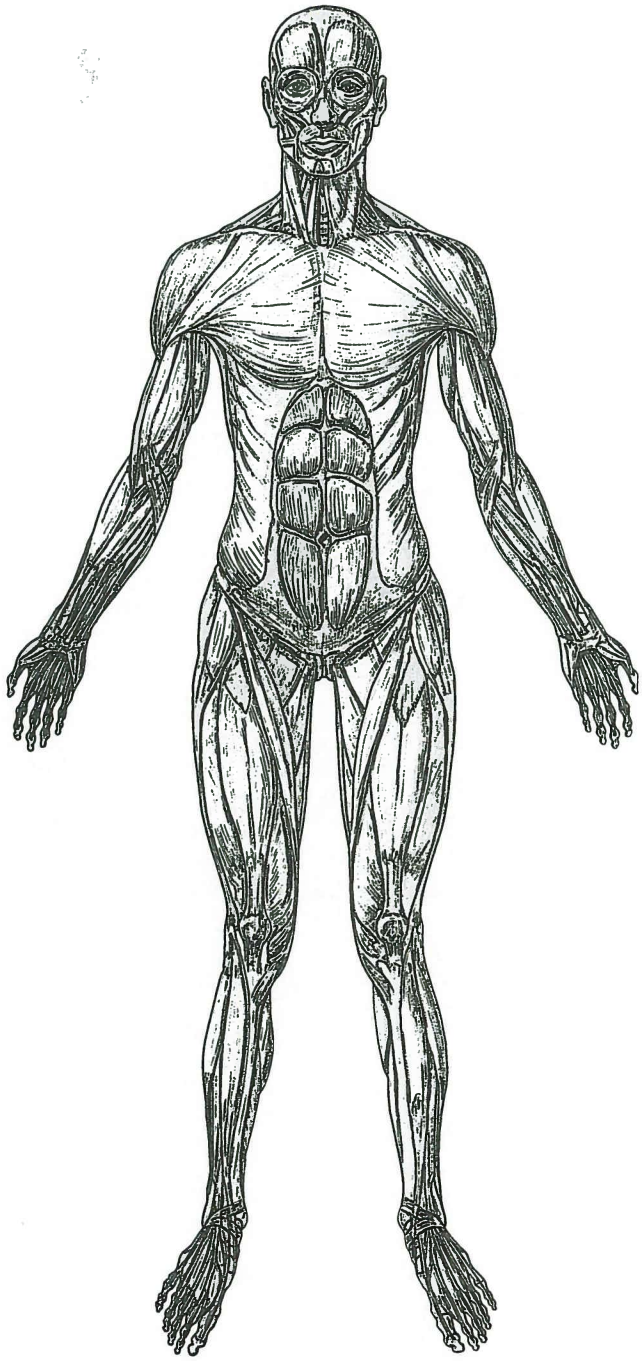
Teacher ☐

Peer ☐

Self ☐

This exercise will help you become more familiar with the major muscles of the human body.

Mission: Use a different coloured pencil crayon to colour each word on the right-hand side of the page. Then use the same colour to identify the corresponding muscle on the illustration of the anterior muscular system below.

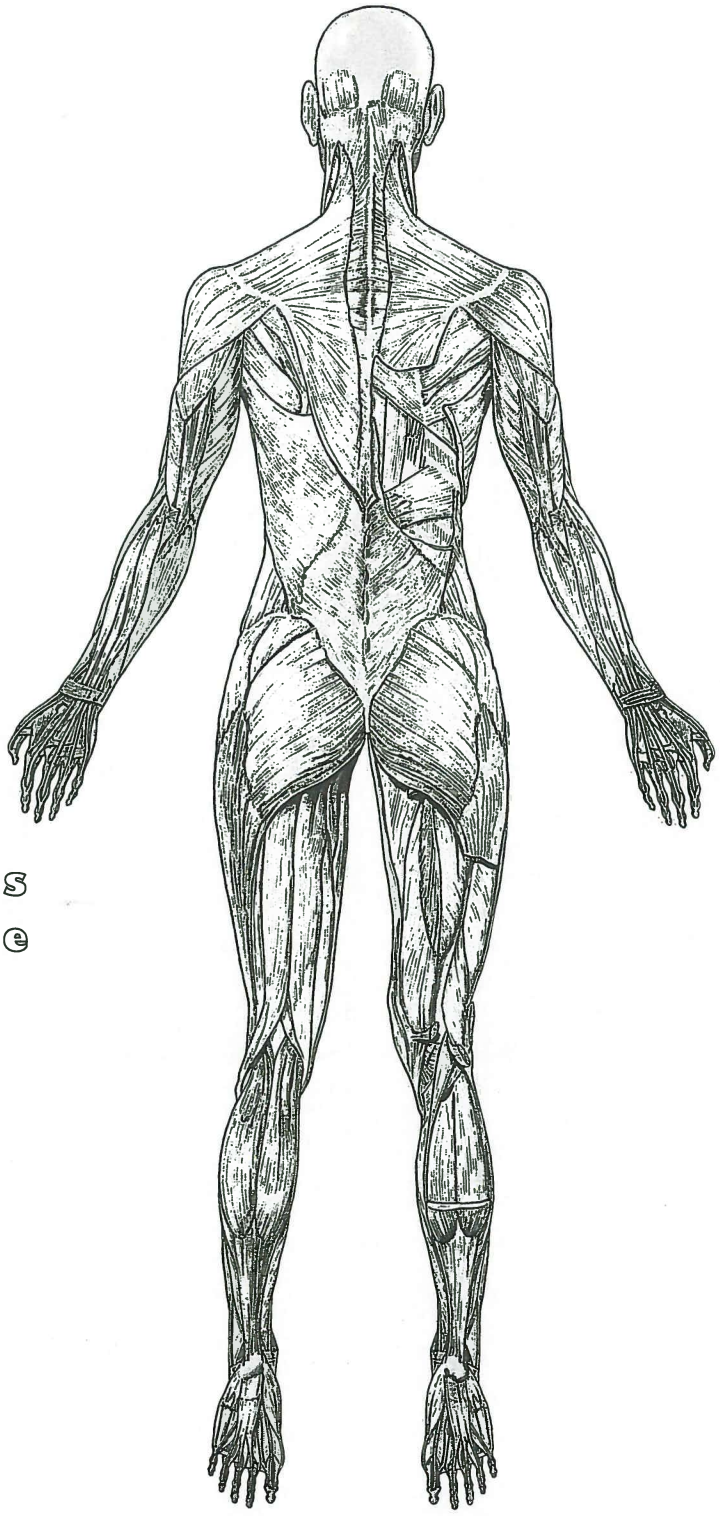


- ☐ Facial Muscles
- ☐ Sternocleido-mastoid
- ☐ Iliopsoas
- ☐ Adductor Longus
- ☐ Deltoids
- ☐ Pectoralis Major
- ☐ Rectus Abdominus
- ☐ Biceps Brachii
- ☐ Brachialis
- ☐ Wrist and Finger Flexors
- ☐ Tensor Fasciae Lata
- ☐ Sartorius
- ☐ Quadriceps Group
- ☐ Tibialis Anterior
- ☐ Tibia

Major Muscles (Posterior)

Mission: Use a different pencil crayon to colour each word on the left-hand side of the page. Then use the same colour to identify the corresponding muscle on the illustration of the posterior muscular system below.

- ☐ Trapezius
- ☐ Latissimus Dorsi
- ☐ Triceps Brachii
- ☐ Gluteus Medius
- ☐ Gluteus Maximus
- ☐ Hamstring Group
- ☐ Gastrocnemius
- ☐ Erector Spinae Group
- ☐ Soleus



Joints

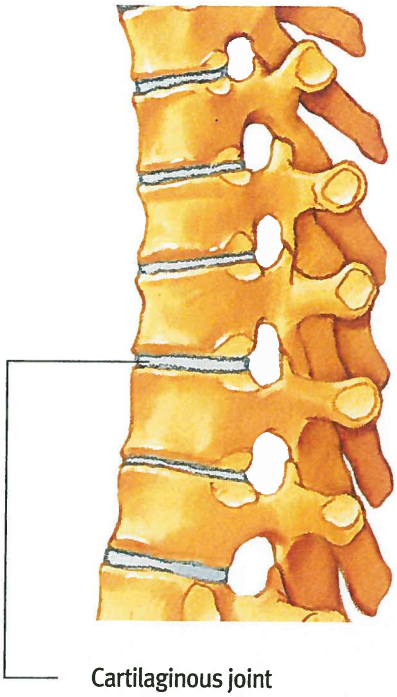
Bones are connected at areas called **joints** which are held together by various connective tissues including ligaments and muscles. Elbows, knees, and knuckles are commonly-known joints, but there are many more. In fact, we have over 140 joints in our bodies.

Most bones are connected to one or more other bones by joints. One bone, the hyoid bone, which helps protect the voice box in your throat, is the only bone in the body which does not connect to another bone. In fact, it anchors your tongue in your mouth.

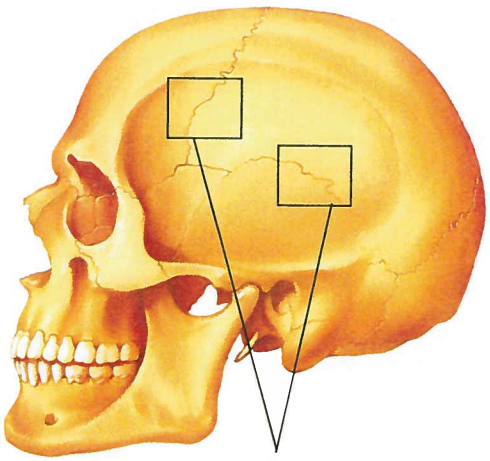
Types of Joints

Joints are classified by their structure and function. There are three major types of joints.

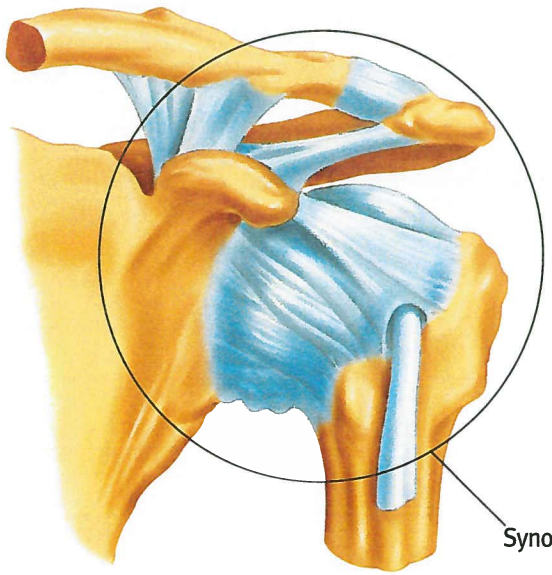
- **Fibrous joints** (or immovable joints) are held together by strong, fibrous, connective tissue and, as the name suggests, they permit no movement. Examples of fibrous joints include: where your teeth are anchored in the jawbone, and where the bones of the skull come together.
- **Cartilaginous joints** (or slightly moveable joints) are connected by cartilage and allow partial movement. The stacked vertebrae bones in your spine, for example, are held together by cartilaginous joints.
- **Synovial joints** (or freely moveable joints) provide the most movement and are the most common of all joints found in the body. Some examples include: the shoulders, elbows, wrists, hips, knees, and ankles. See "The Synovial Joint" on the next page for more information on how a synovial joint works and "Types of Synovial Joints" on pages 34 and 35 for more information on the different types of synovial joints in our bodies.



Cartilaginous joint

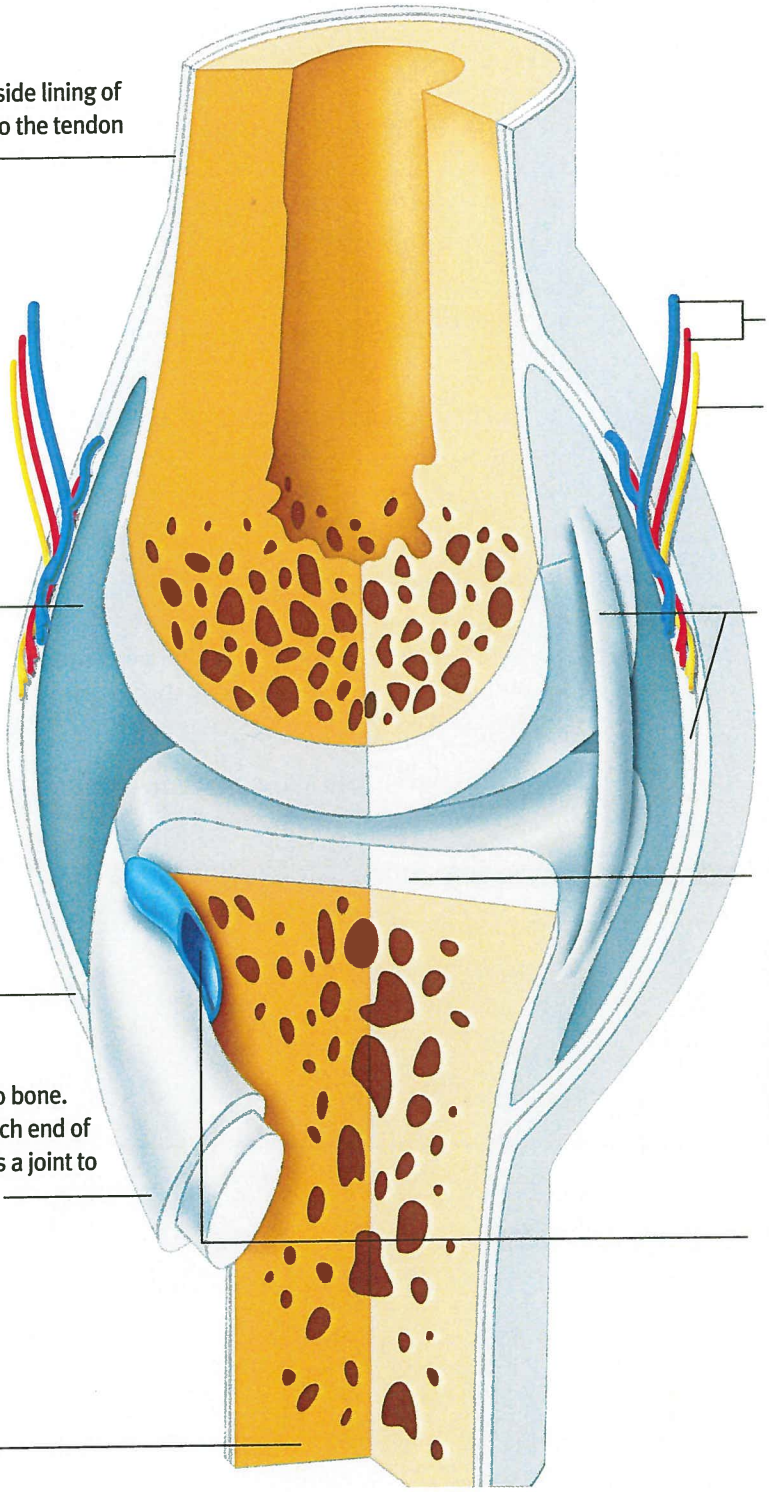


Fibrous joint



Synovial joint

The Synovial Joint
A Flexible Connection



The **periosteum** is the outside lining of the bone which connects to the tendon of the muscle.

The **joint cavity** is the space between the bones in a synovial joint. It is filled with synovial fluid, which acts as a lubricant. This lubricant reduces friction and provides nutrients for the articular cartilage.

The **joint capsule** is a bag-like outer structure of the joint and is made up of strong fibres to protect all the structures within. The synovial membrane lines the capsule and allows certain nutrients to pass through into the joint.

Tendons attach muscles to bone. Tendons are located on each end of skeletal muscles and cross a joint to attach to the bones.

Bone

Blood vessels bring in nutrients and remove waste products.

Nerves send and receive messages from the brain.

Ligaments are thick bands of fibrous tissue that help thicken and reinforce the joint capsule and also connect bone to bone. They also prevent the bones from dislocating during normal movement.

The **articular cartilage** is located on the ends of bones that come in contact with one another. This cartilage protects the ends of the bone by reducing friction. It allows for a smooth contact surface for the bones to move about while also acting as a shock absorber.

The **bursae** are the small, flattened fluid sacs found at the friction points between tendons, ligaments, and bones.

Keeping Your Joints Healthy

Synovial joints generally take longer to warm up than muscles. Warming them up allows ligaments, tendons, cartilage, and the other structures a chance to get ready for activity.

Other tips to keep your joints healthy and strong include:

- Wearing protective equipment such as knee pads, helmets, and wrist guards
- Treating injuries promptly and getting proper medical attention when needed
- Obeying the rules of the game and following safety procedures when playing on streets, wooded trails, and in pools
- Performing resistance exercises such as lifting weights

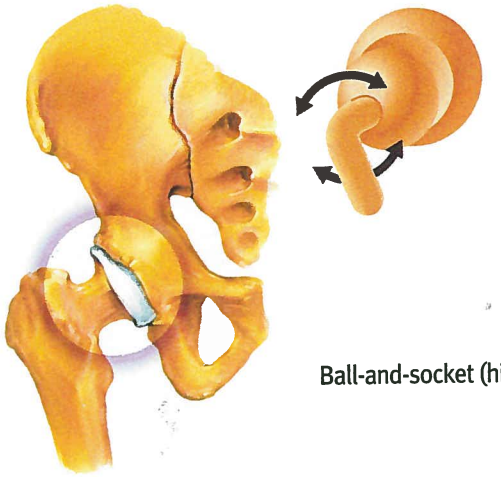
Types of Synovial Joints

There are basically six types of synovial joints. These are usually distinguished by the kind of movement they allow. Some types allow for limited movement (one direction), while others allow for maximal movement (multi-direction).

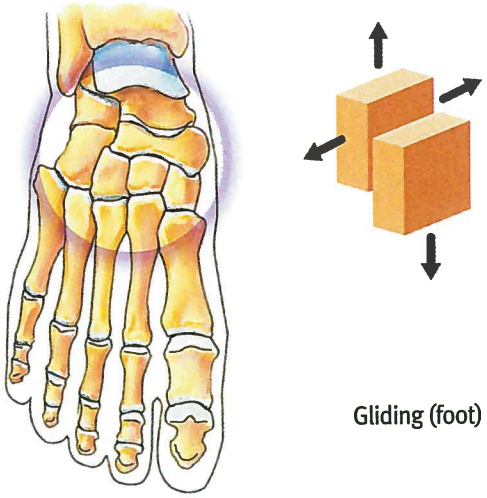
Outlined below are some of the key characteristics of the different types of synovial joints. On the next page, there are illustrations of the six types.

- **Ball-and-socket joints** provide the most movement of all the synovial joints. As the name suggests, one end of a bone has a ball shape that fits into a bone with a socket shape. The shoulder and hip are types of ball-and-socket joints.
- **Gliding joints** connect flat or slightly curved bone surfaces. Examples of gliding joints include joints in the foot and in the hand.
- **Hinge joints** have a convex portion of one bone fitting into a concave portion of another, and allow movement around one axis. The elbow, the knee, and the joints between the bones of the fingers are examples.
- **Pivot joints** also allow movement around one axis. A rounded point of one bone fits into a groove of another. An example is the joint between the first two vertebrae in the neck (the axis and the atlas), which allows the rotation of the head from side to side.
- **Ellipsoid joints** allow movement around two axes. The wrist is an example of an ellipsoidal joint.
- **Saddle joints**, like ellipsoid joints, allow movement around two axes. A key saddle joint is found at the base of the thumb.

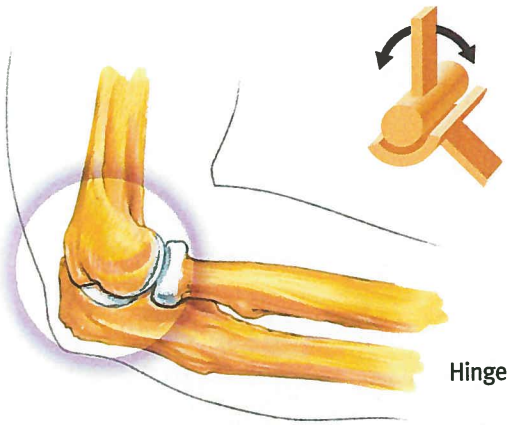
Proper warm-ups, cool-downs, and stretches help your joints stay strong and healthy.



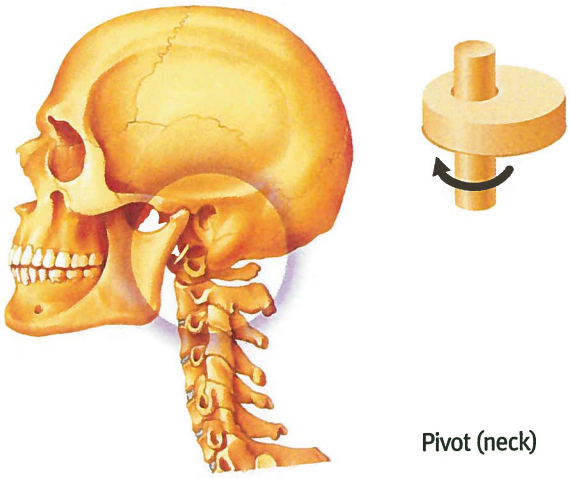
Ball-and-socket (hip)



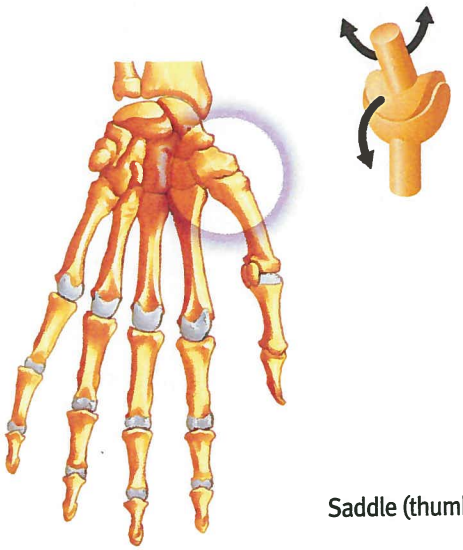
Gliding (foot)



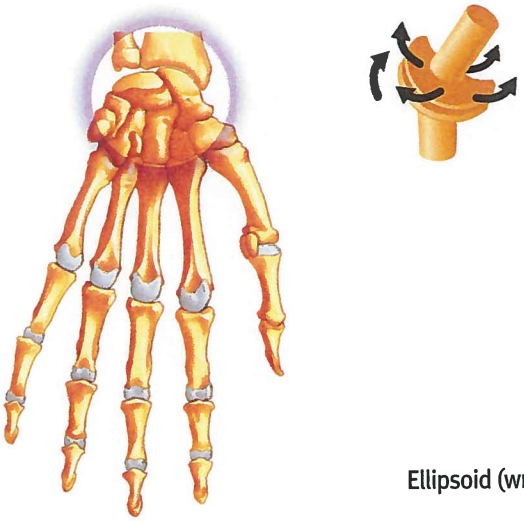
Hinge (elbow)



Pivot (neck)



Saddle (thumb)



Ellipsoid (wrist)

Exercise 1.3

The Synovial Joint

Look in the Book
Pages: 33–35

Student name:

Class/Period:

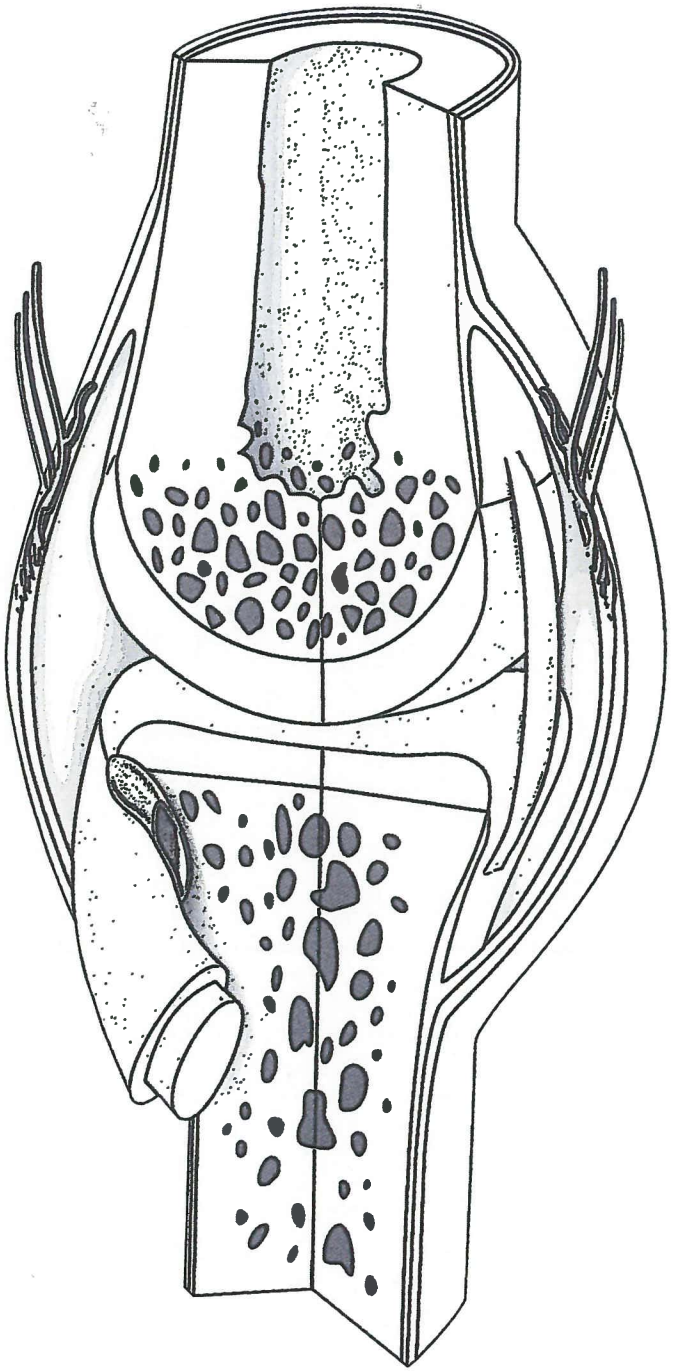
Date:

Assessed by:

Teacher ☐
Peer ☐
Self ☐

Synovial joints provide the most movement and are the most common of all joints found in the body.

Mission: Use a different coloured pencil crayon to colour each word on the right-hand side of the page. Then use the same colour to identify the corresponding part of the synovial joint below.

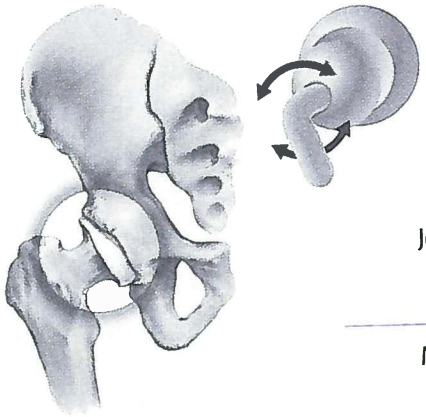


- ☐ Periosteum
- ☐ Joint cavity
- ☐ Joint capsule
- ☐ Tendons
- ☐ Bone
- ☐ Blood vessels
- ☐ Nerves
- ☐ Bursae
- ☐ Ligaments
- ☐ Articular cartilage

Types of Synovial Joints

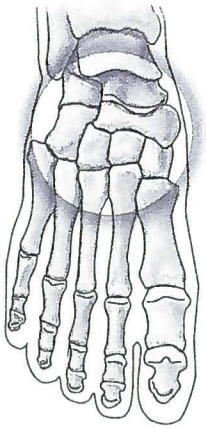
There are six types of synovial joints. Some types allow for limited movement (one direction), while others allow for maximal movement (multi-direction).

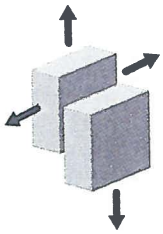
Mission: Name each type of synovial joint and describe the type of movement each synovial joint allows.



Joint name: _____

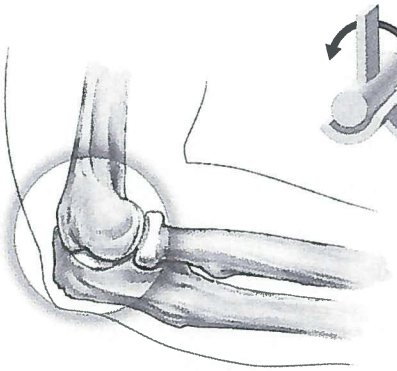
Movement: _____





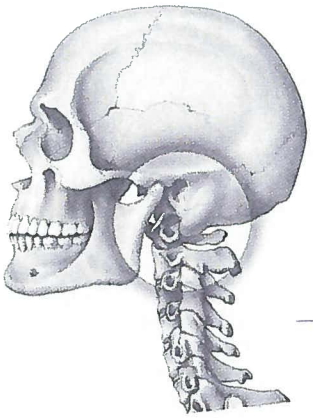
Joint name: _____

Movement: _____



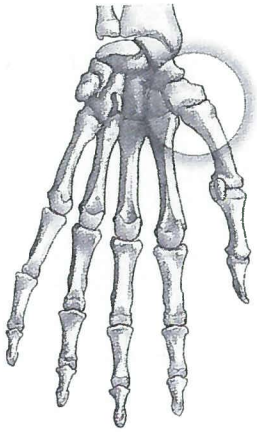
Joint name: _____

Movement: _____



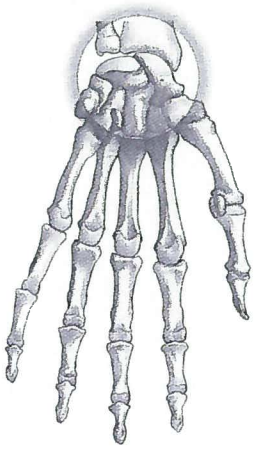
Joint name: _____

Movement: _____



Joint name: _____

Movement: _____



Joint name: _____

Movement: _____

Muscle Pairs

Some muscles work together as **muscle pairs**. For example, if one muscle performs a flexing action, the other performs an extending action.

Below are examples of muscles that work in pairs:

- The biceps brachii flexes the elbow and triceps brachii extends it.
- The deltoid muscle abducts the arm and latissimus dorsi adducts it back.
- Two small muscles (not illustrated on pages 30 and 31) located on the deep surface of the forearm, called supinator and pronator teres, supinate and pronate your hand.
- Tibialis anterior, located on the front of your lower leg, dorsiflexes your foot while gastrocnemius (the major muscle in the calf at the back of your lower leg) plantar flexes it.

Types of Movement at Joints

Starting from the anatomical position, the following terms are used to describe the types of movement at joints. Each type of movement is illustrated on the next page.

- **Flexion** is the action of bending at a joint such that the joint angle decreases. An example of flexion is when you bend your elbow to bring your palm up towards your face (the angle between your upper and lower arm gets smaller).
- **Extension** is the opposite of flexion. It occurs when you increase the joint angle. When you straighten your arm from the flexed position, you are extending your arm.

- **Abduction** occurs when you move a body segment to the side and away from your body. An example of abduction is when you move your arm out to the side and bring it level with your shoulder.
- **Adduction** is the opposite of abduction and occurs when you move a body segment towards your body. You adduct your arm when you bring it back down to your side.

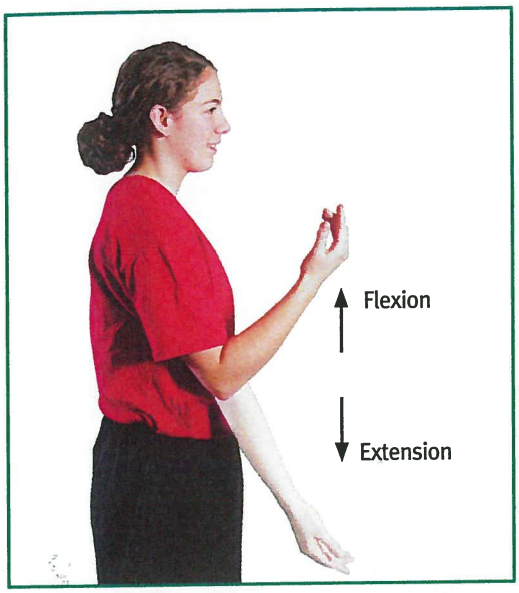
- **Supination** is rotating the wrist such that the palm of your hand is facing forward. When you catch a softball underhanded with one hand, you must supinate your wrist.
- **Pronation** occurs in the opposite direction of supination. When you dribble a basketball, you first have to pronate your wrist.

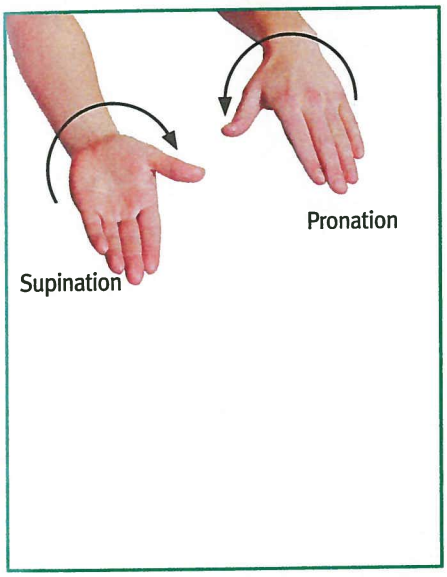
- **Dorsiflexion** is specific to the ankle joint. It occurs when you bend at the ankle to bring the top of your foot closer to your shin. It is essential when walking, jumping, or sprinting.
- **Plantar flexion** is also specific to the ankle joint. It occurs when you point your toes.

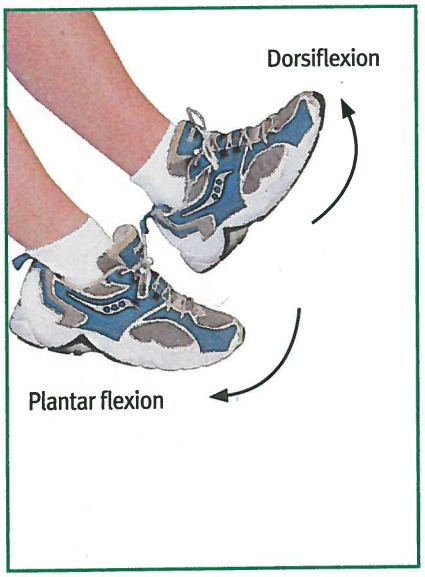
- **Inversion** is associated with the ankle joint. Inversion is a result of standing on the outer edge of your foot. It is normally what happens when you twist your ankle.
- **Eversion** also is associated with the ankle joint. Eversion is a result of standing on the inner edge of your foot.

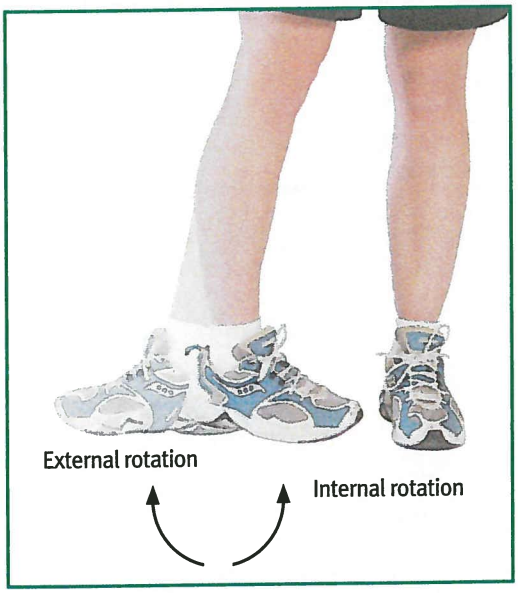
- **Internal rotation** results when you twist or turn a body part inward towards the midline. You internally rotate your foot when you turn your toes inward.
- **External rotation** results when you twist or turn a body part outward from the midline. You externally rotate your foot when you turn your toes outward.

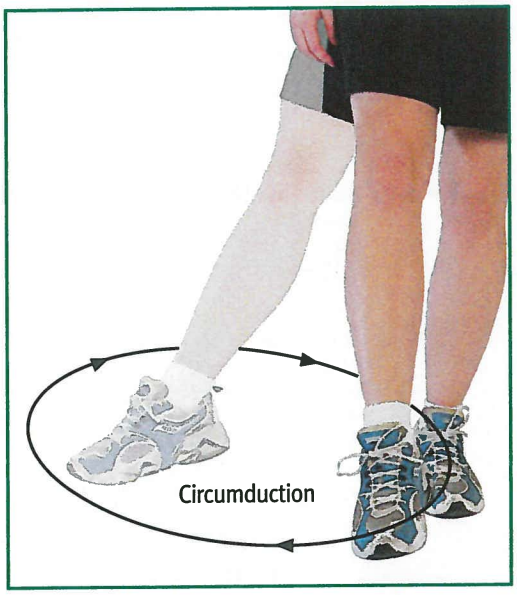
- **Circumduction** is a combination of flexion, extension, abduction, and adduction all wrapped up into one movement. An example of this occurs in softball, when a pitcher throws the ball with a windmill action.











The basic types of movement at joints.

Exercise 1.5

Joint Movements

Look in the Book
Pages: 36–37

Understanding the basic movements at your joints gives you a better idea of which exercises you need to focus on to improve your performance in different skills.

Mission: Complete the following diagram by labelling the different joint movements with the terms on the right-hand side of this page.

Student name:

Class/Period:

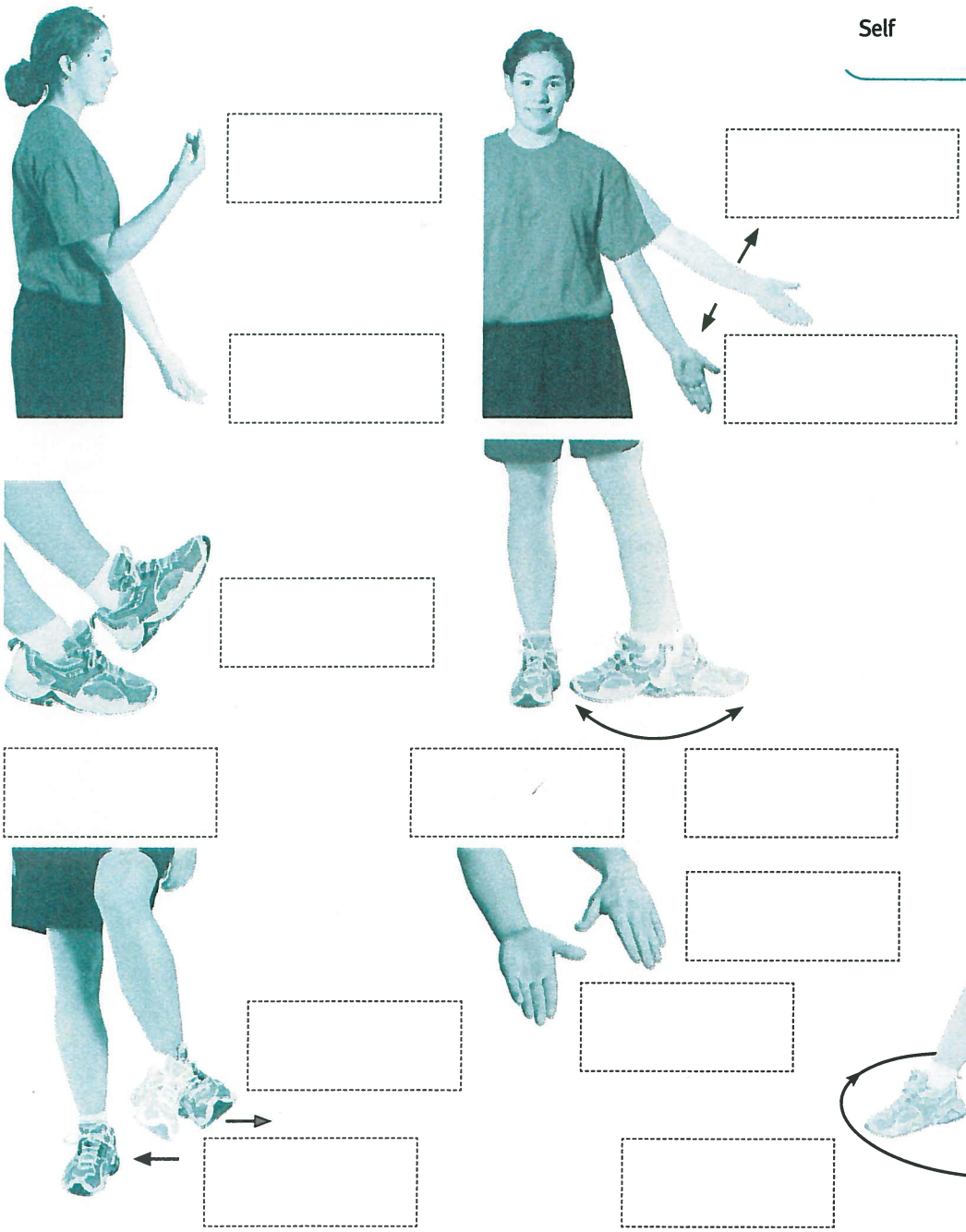
Date:

Assessed by:

Teacher ☐

Peer ☐

Self ☐



- Eversion
- Inversion
- Flexion
- Extension
- Abduction
- Adduction
- Dorsiflexion
- Plantar flexion
- External rotation
- Internal rotation
- Pronation
- Supination
- Circumduction

Defining Movements at Joints

The following exercise will help you learn the anatomical terms used to describe the movement that occurs at joints.

Mission: Answer the following questions using the terms below.

flexion **extension** **abduction** **adduction** **supination** **pronation**

dorsiflexion **plantar flexion** **inversion** **eversion** **rotation** **circumduction**

1. What is the movement at the knee joint when your leg moves forward to kick a soccer ball? ----------→
2. What is the movement at the ankle joint when you're lifting your heels off the ground and keeping your toes and the balls of your feet planted? ----------→
3. What is the movement of your ankle joint when you're standing on the inner edge of your foot? ----------→
4. What is the movement of your shoulder joint when you raise your arm to the side to stop a goal in soccer? ----------→
5. What is the movement at your elbow joint when you lift a dumbbell up toward your body? ----------→
6. What is the rotating action of your hand at the wrist when the palm of your hand is facing upward? ----------→
7. What is the movement of your ankle joint when you're standing on the outer edge of your foot? ----------→
8. What movement occurs at your hip joint when you return your leg to the midline of your body while skating? ----------→
9. What is the movement that occurs when a pitcher throws the ball with a windmill action? ----------→
10. What is the movement of your ankle joint when you are bringing the top of your foot closer to your shin, which is an essential movement to walking or running? ----------→