kinetic chain
nervous system, skeletal system and muscular system

primary nervous system functions
sensory function, integrative function, motor function

sensory function
ability to sense changes in either external or internal environments

integrative function
ability to analyze and interpret sensory information to allow for proper decision making, which produces appropriate response

motor function
neuromuscular response to sensory information

sensory/afferent
transmit nerve impulses from effector sites to cns

interneurons
from one neuron to another

motor/efferent neurons
from cns to effector sites

cns
interprets information

peripheral nervous system
12 cranial nerves, 31 pairs of spinal nerves, and sensory receptors; relay info to and from brain

sensory receptors
mechanoreceptors, nociceptors, chemoreceptors, photoreceptors

mechanoreceptors
sensory receptor responsible for sensing distortion in body tissues. muscle spindles, golgi tendon organs, joint receptors

muscle spindles
fibers sensitive to change in length of muscle and rate of that change; major sensory organs of muscle. parallel to muscle fibers. transmit info to cns when stretched. causes muscle to contract to prevent overstretching/ stretching too fast.

golgi tendon organs
organs sensitive to change in tension of the muscle and the rate of that change. musculotendinous junction. sensitive to changes in muscular tension and rate of tension change. causes relaxation to prevent xs stress/injury.

joint receptors
in and around jt capsule. respond to pressure, acceleration and deceleration of jt. signal extremel jt positions. initiate reflexive inhibitory response in surrounding muscles.

axial skeleton
skull, rib cage, vertebral column
80 bones

appendicular skeleton
upper and lower extremities, shoulder and pelvic girdles; 126 bones

pelvic girdle
some authors consider it a component of either axial or appendicular and actually a link between the two

total bones
206; 177 used in voluntary movement

total joints
over 300

bone function
leverage; provide support (posture) for efficient distribution of forces acting on body

types of bones
long, short, flat, irregular

long bones
long cylindrical shaft and irregular or widened ends; mostly compact bone tissue for strength and stiffness with spongy bone tissue for shock absorptionex humerus, femur, clavicle, radius, ulna, metacarpals, phalanges, tibia, fibula, metatarsals, phalanges

short
similar in length and width, somewhat cubical; mostly spongy for shock absorption; carpals of hands, tarsals of feet

flat

thin, protective; two layers of compact bone around spongy bone; protection of internal structures and broad attachment sites for muscles. sternum, ribs, ilium cranial bones, scapulae, patella

irregular
unique shape and function; vertebrae, pelvic bones, some facial bones

depressions
flat/indented portion of bone which can be a muscle attachment site. fossa, sulcus

processes
projection protruding from bone where muscles, ligaments and tendons can attach. process, condyle, epicondyle, tubercle, trochanter

fossa
supraspinous fossa, infraspinous fossa of scapulae

sulcus
groove; intertubercular sulcus for biceps tendon; between greater and lesser tubercles of humerus

process
spinous process on vertebrae; acromion and coracoid processes on scapulae

condyles
inner and outer portion at bottom of femur, top of tibia forming knee joint

epicondyles
inner and outer portion of humerus-elbow

tubercles
top of humerus at glenohumeral joint; greater and lesser tubercles; attachments of shoulder muscles

trochanters
top of femur; attachment of hip muscles; greater trochanter is commonly called hip bone

arthrokinematics
joint motion: roll, slide, spin

roll
femoral condyes moving over tibial condyles during squat

slide
tibial condyles moving across femoral condyles during knee extension

spin
head of radius rotating on end of humerus during pronation/supination

synovial joints
80 percent of joints; greatest capacity for motion; no fibrous/cartilaginous tissue. synovial fluid. held together by joint capsule and ligaments.

types of synovial joints
gliding (plane)
condyloid (condylar or ellipsoidal)
hinge
saddle
pivot
ball and socket

gliding/plant joint
non axial joint. simplest movement; back and forth or side to side. ex: navicular bone and second or third cuneiform bones in foot; carpals of hand; facet joints

condyloid
condyle of one bone fits into elliptical cavity of other bone; movement in one plane only. wrist between radius and carpals; knee joint. flexion/extension in sagittal plane

hinge joint
uninaxial. sagittal plane only. elbow, interphalangeal, ankle

saddle joint
only in carpometacarpal joint of thumb; sagittal, frontal plane, plus some rotation; circumduction

pivot joints
rotation, pronation/supination in transverse plane. alantoaxial joint at base of skull; radioulnar joint

ball and socket
most mobile. all three planes. shoulder, hip.

nonsynovial joints
no joint cavity, connective tissue or cartilage; little/no movement; sutures, distal tib/fib (ankle), symphysis pubis.

ligament
primary connective tissue that connects bones together and provides stability (static, dynamic), input to nervous system, guidance and limitation of improper joint movement. made of collagen and varying amounts of elastin. poor vascularity; slow to heal, adapt

collagen
parallel to forces placed on ligament. provide ligament with ability to withstand tension (tensile strength)

elastin
gives ligament some flexibility or elastic recoil to withstand bending and twisting

anterior cruciate ligament
low elastin, mostly collagen; resists strong forces; good stabilizing structure

from outer to inner
fascia,epimysium (tendon), muscle, perimysium, fascicle, endomysium, individual muscle fibers

tendon formed by
fascia and epimysium

fascicles are wrapped by
perimysium

individual muscle fibers are wrapped by
endomysium

tendon
attach muscle to bone

sarcolemma
plasma membrane of muscle fibers

myofibrils
structures unique to muscle cells which contain myofilaments

myofilaments
actual contractile components of muscle tissue; actin and myosin

actin
thin filaments;

myosin
thick filaments

sarcomere
functional unit of muscle; produces contraction and consists of repeating sections of actin and myosin

sarcomere lies in space between two
z lines

tropomyosin
on actin filament; blocks myosin binding sites on actin filament; keeps myosin from attachin to actin when muscle is relaxed

troponin
on actin; provides binding sites for calcium and tropomyosin when muscle needs to contract

motor unit
motor neuron and muscle fibers it innervates

ach
once attached, stimulates muscle fibers to go through series of steps that produe muscle contractions

sliding filament theory
z lines move closer together, sarcomere shortens. myosin heads attach to actin, z lines converge. asynchronous pulling=power strokes.

calcium
released into sarcoplasm and binds to troponin

binding of calcium to troponin
forces tropomyosin to move away from myosin binding site allowing for myosin to bind to actin

muscle fiber types
chemical and mechanical properties. type I and type II fibers

type I
slow twitch.
more caps, mit, myoglobin

increased oxygen delivery
smaller
less force
slow to fatigue
long term contractions (stabilization)
slow twitch

type II
lower cap, mit, myoglobin
decreased oxygen delivery
larger
more force
quick to fatigue
short term; force and power
fast twitch

type IIa
higher oxidative capacity and fatigue more slowly than IIb

type IIb
low oxidative capacity and fatigue quickly

type II
white

type I
red

type I
sitting upright, maintaing ideal posture against gravity for extended period of time

type II
sprint

anterior tibialis
mostly slow type I

lateral head of gastroc
half type I

pennation

muscle fibers that run at an angle to tendon; pennation increases force out put of muscle. allows larger number of muscle fibers to be placed in a smaller space; creastes greater cross sectional area of muscle that would appear to be smaller