



RPT

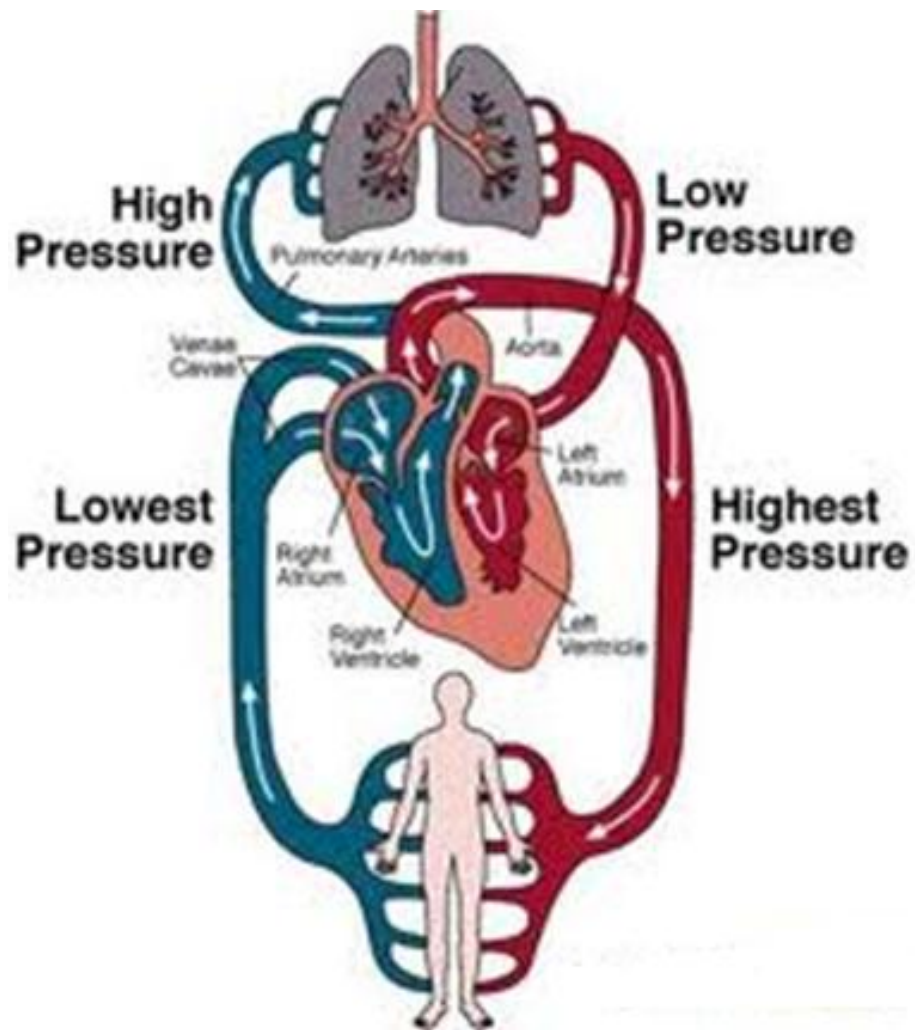
REGISTRO PROFESIONAL
DE TENIS

Anatomy and Physiology

Understand the structure and function of the circulatory system

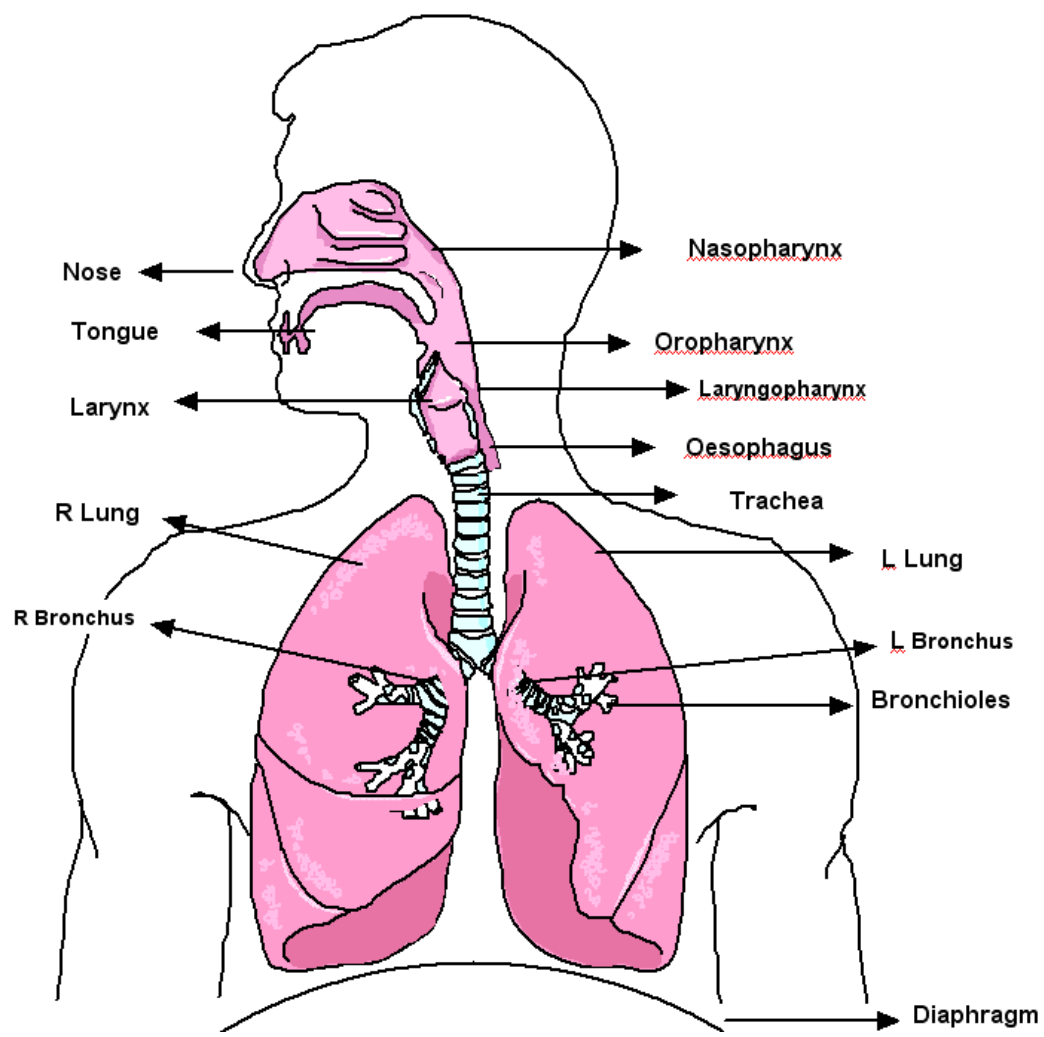
- Location of heart: located centrally in the chest; mediastinum; thorax; between lungs; apex towards left hip.
- Function and structure of heart: function of heart (circulation of blood, receiving and pumping blood to body and lungs); structure of heart (myocardium, septum, atria, ventricles, atrioventricular valves, semi-lunar valves, aorta, superior vena cava, inferior vena cava, pulmonary veins, pulmonary arteries).
- Blood flow through heart chambers: pulmonary circulation; deoxygenated blood; vena cava; right atrium, tricuspid valve; right ventricle; semi-lunar valve; pulmonary artery; lungs; gaseous exchange; oxygenated blood; pulmonary vein; left atrium; bicuspid valve; left ventricle; semi-lunar valve; aorta; systemic circulation; functional considerations (e.g. stroke volume, cardiac output).
- Systemic and pulmonary circulation: systemic (oxygenated blood from lungs, pulmonary vein, left atrium, left ventricle, aorta; arteries, arterioles, capillaries, muscles and organs); pulmonary (deoxygenated blood from muscles and organs, capillaries, venules, veins, vena cava, right atrium, right ventricle, deoxygenated blood to the lungs for oxygenation).

- Structure and function of blood vessels: arteries (tunica interna, tunica media, tunica externa); arterioles; capillaries; veins (tunica interna, tunica media, tunica externa, one way valves); venules; comparison between blood vessels (wall thickness, internal diameter, direction of blood flow, pressure, presence of valves); functions of blood vessels (transport blood, blood flow distribution by vasoconstriction and vasodilation); function of arteries and arterioles (transport oxygenated blood to muscles and organs), functions of veins and venules (transport deoxygenated blood back to the heart, venous return); functions of capillaries (exchange of gases and nutrients between blood and tissues).
- Blood pressure: definition of blood pressure (pressure exerted by blood on vessel wall); systolic pressure (contraction); diastolic pressure (relaxation); blood pressure classifications (hypotension, normal, high normal, mild hypertension, moderate hypertension, severe hypertension); short and long term effects of exercise on blood pressure.



Understand the structure and function of the respiratory system

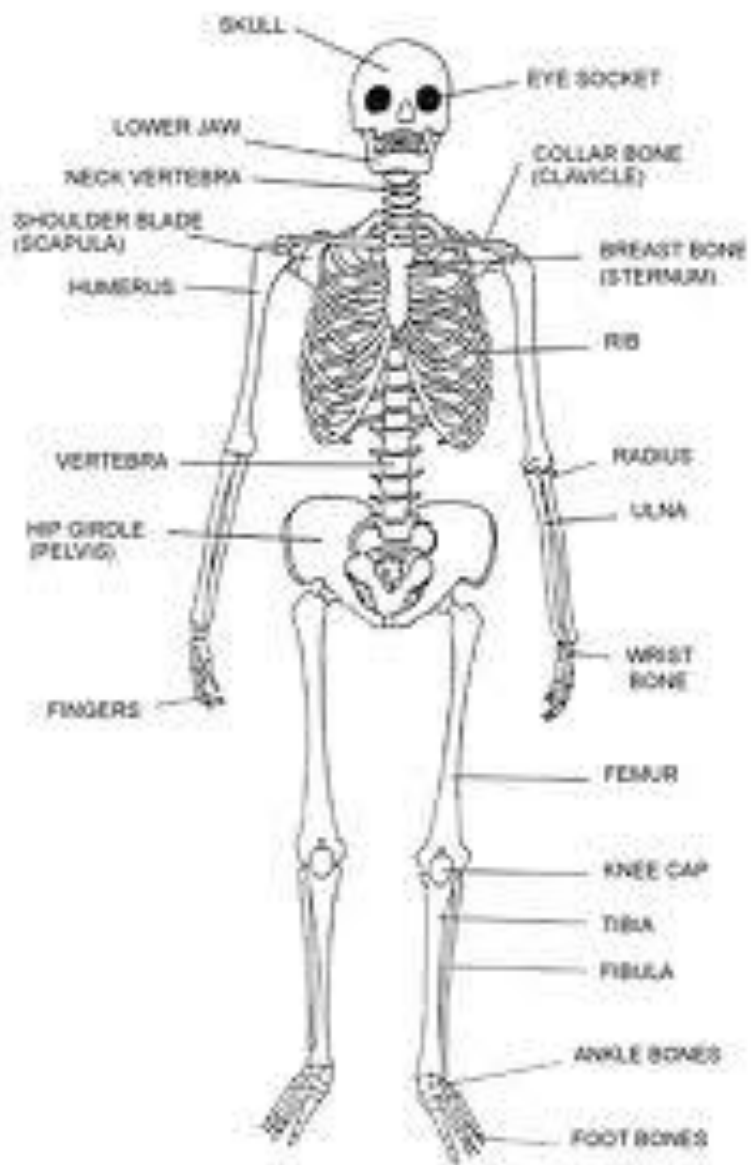
- Location of the lungs: located laterally in the chest on left and right sides; mediastinum; thorax; pleural membrane layer; visceral membrane layer; serous membrane layer.
- Function and structure of the lungs: function of lungs (paired organs for ventilation, external and internal respiration, elimination of carbon dioxide, supply of oxygen); structure of lungs (left lung – two lobes, right lung - three lobes, bronchus, bronchioles, sub-divisions, capillaries, alveoli, alveolar sacs).
- Muscles involved in breathing: inhalation (inspiration); exhalation (expiration); muscles involved (diaphragm, external intercostals); forced inspiration accessory muscles (sternocleidomastoids, scalenes, pectoralis minor); forced expiration muscles (internal intercostals, transversus abdominus, rectus abdominus); functional considerations (e.g. total lung capacity, vital capacity).
- Passage of air during breathing: upper respiratory tract (mouth, nose and pharynx); lower respiratory tract (larynx, trachea, bronchi, bronchioles); alveoli; alveolar sacs.
- Process of gaseous exchange: surface area for gas exchange (300million alveoli, 2400km of airways); partial pressure difference (higher and lower partial pressures); diffusion of gases; effect of breathing rate and depth; relative composition of inhaled air (21% oxygen, 0.04 % carbon dioxide); relative composition of alveolar air (14% oxygen, 5.5 % carbon dioxide); relative composition of exhaled air (16% oxygen, 4.5% carbon dioxide).



Understand the structure and function of the skeleton

- **Functions of the skeleton:** support and shape; protection; muscle attachment and movement; production of blood cells; mineral homeostasis; storage of energy.
- **Structures of axial skeleton:** names and locations of bones including cranium; cervical vertebrae (seven); thoracic vertebrae (twelve); lumbar vertebrae (five); sacral vertebrae (five); coccyx (three to five); intervertebral discs; sternum; ribs.
- **Structures of appendicular skeleton:** names and locations of bones including scapula; clavicle; humerus; radius; ulna; carpals; metacarpals; phalanges; ilium; ischium; pubis; femur; patella; tibia; fibula; tarsals; metatarsals; phalanges.
- **Classification of bones:** long (e.g. femur, tibia); short (e.g. tarsals, carpals); flat (e.g. scapula, pelvis); irregular (e.g. vertebrae); sesamoid (e.g. patella); classification based on structure and function.
- **Structure of long bone:** characteristics (greater length than width, slightly curved); structure (diaphysis, epiphyses, metaphysis, articular cartilage, periosteum, medullary, endosteum, compact bone, spongy bone, bone marrow).

- **Stages of bone growth:** development of cartilage; growth of cartilage; development of ossification centre; development of diaphysis and epiphysis; ossification (osteoblasts, osteoclasts); changes in bone growth with age; importance of calcium; factors affecting bone density (exercise, age and osteoporosis).
- **Posture and curves of the spine:** natural mild S-shaped curve of the spine (cervical and lumbar lordoses, thoracic and spinal kyphoses); primary curves of the spine; secondary (developmental) curves of the spine.
- **Posture and neutral spine alignment:** optimum position of spine and pelvis; maintenance of the natural spinal curvature (cervical, thoracic, lumbar); maintenance of posture in standing, sitting, lying positions.
- **Posture and potential ranges of motion of the spine:** cervical (rotation, flexion and extension); thoracic (rotation, limited flexion and extension); lumbar (flexion, extension, hyperextension); sacral (no range of motion); coccyx (no range of motion); normal thoracic kyphosis (20-45 degrees); normal lumbar lordosis (20-45 degrees); scoliosis (a right-left curve of more than 10 degrees).
- **Postural deviations:** excessive deviations (hyperlordotic and hyperkyphotic); less than normal deviations (hypolordotic and hypokyphotic); definitions and causes (kyphosis, lordosis, scoliosis); effect of pregnancy on posture (e.g. how carrying a baby affects the natural curve).

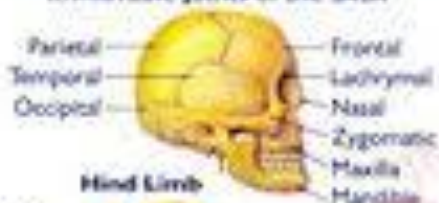


Understand joints of the skeleton

- Classification of joints: structural classifications (fibrous e.g. cranium, cartilaginous e.g. vertebrae, synovial e.g. knee); functional classifications (synarthrosis / immovable, amphiarthrosis / slightly moveable, diarthrosis / freely moveable).
- Structure of synovial joints: articular capsule; fibrous capsule; synovial cavity; synovial membrane; synovial fluid (lubrication); articular cartilage (shock absorption, decrease friction between bones); bursae (shock absorption); ligaments (attach bone to bone, joint stability).
- Types of synovial joints and range of motion: gliding (side to side, back and forth e.g. between carpals and tarsals); pivot (rotation e.g. atlas and axis); saddle (flexion, extension, abduction, adduction, circumduction e.g. thumb); ellipsoid (flexion, extension, abduction, adduction, circumduction e.g. wrist); ball and socket (flexion, extension, abduction, adduction, rotation, circumduction e.g. hip and shoulder); hinge (flexion and extension e.g. knee and elbow).
- Joint movement potential and actions: shoulder (flexion, extension, abduction, adduction, horizontal flexion / adduction, horizontal extension / abduction, internal rotation, external rotation); elbow (flexion, extension, supination, pronation); shoulder girdle (elevation, depression, protraction, retraction); spine (flexion, extension, lateral flexion, rotation); hip (flexion, extension, abduction, adduction, internal rotation, external rotation); knee (flexion, extension); ankle (plantarflexion, dorsiflexion, inversion, eversion); actions during different exercises.

HUMAN SKELETON, JOINTS & LIMBS

Immovable Joints of the Skull



Hind Limb

Fore Limb



Understand the muscular system

- **Muscle tissue types, characteristics and functions:** skeletal muscle (striated, voluntary, very large fibre diameter, short to moderate fibre length, fast speed of contraction, attach to bones, e.g. quadriceps); cardiac muscle (striated, involuntary, large fibre diameter, moderate fibre length, moderate speed of contraction, e.g. heart muscle / myocardium); smooth muscle (no striations, involuntary, small fibre diameter, short to long fibre length, slow speed of contraction, e.g. artery walls).
- **Structure of skeletal muscle:** tendon (attach muscle to bone); epimysium, perimysium; endomysium; fascicle; muscle fibres; myofibrils; myofilaments (actin, myosin); sarcolemma; sarcomere (Z discs, H zone, M line, A band, I bands); arrangement of fasciculi (parallel, fusiform, pennate).
- **Muscle names and locations:** anterior muscles (pectoralis major, anterior deltoids, medial deltoids, biceps, rectus abdominis, obliques, transverse abdominis, hip flexors, quadriceps, adductors, anterior tibialis); posterior muscles (trapezius, rhomboids, medial deltoids, posterior deltoids, triceps, latissimus dorsi, erector spinae, gluteals, abductors, hamstrings, gastrocnemius, soleus); diaphragm, intercostals.

- **Structure and function of pelvic floor muscles:** levator ani (pubococcygeus, puborectalis, and iliococcygeus); coccygeus; associated connective tissues which span the area underneath the pelvis (perineum, perineal membrane, perineal pouch); pelvic cavity; function (stability of the pelvis, support bladder and bowel, support uterus in women).
- **Types of muscle action:** definitions of muscle contractions (isotonic concentric, isotonic eccentric, static / isometric, isokinetic); definitions of muscle roles (agonist / prime mover, antagonist, synergist / assistor, fixator); contractions and muscle roles during different exercises.



- Joint actions: pectoralis major (adduction of arm, horizontal flexion of arm); deltoids (abduction of the shoulder, flexion and extension of the shoulder); biceps (flexion of the elbow); rectus abdominis (flexion of the spine); obliques (lateral flexion and rotation of the spine); transverse abdominis (isometric stabilisation of the spine); hip flexors (flexion of the hip); quadriceps (extension of the knee, flexion of the hip); adductors (adduction of the hip); anterior tibialis (dorsi flexion of the ankle); trapezius (extension of the neck, elevation of the shoulder, depression of the scapula, retraction of the scapula); triceps (extension of the elbow); latissimus dorsi (adduction of the shoulder, shoulder extension); erector spinae (extension of the spine); gluteals (extension of the hip); abductors (abduction of the hip); hamstrings (flexion of the knee, extension of the hip); gastrocnemius (plantar flexion of the ankle, assist flexion of knee); soleus (plantar flexion of ankle with bent knee); joint actions during different exercises.
- Muscle fibre types and characteristics: fast twitch type 2 (white in colour, high intensity, short duration, low in mitochondria, low in myoglobin, fast contraction speed, fast to fatigue); slow twitch oxidative type 1 (red in colour, low intensity, long duration / endurance, high in mitochondria, high in myoglobin, slow contraction speed, resistant to fatigue).

Understand the energy systems and their relation to exercise

- Nutrients and the production of energy: carbohydrate (e.g. bread, pasta); proteins (e.g. meat, fish); fats (e.g. cheese, butter); energy yield per gram of macronutrient; carbohydrates (break down into glucose, glycogen storage in muscles and liver); fats (break down into fatty acids in presence of oxygen, stored as adipose tissue, protection, energy store); protein (break down into amino acids, growth and repair of muscle, used for energy when other nutrients are depleted); water (hydration);
- Adenosine Triphosphate (break down and resynthesis, energy equation).
- Energy systems: energy molecules (ADP, ATP); systems (creatine phosphate system, glycolytic system, aerobic system).
- Use of energy systems during exercise: creatine phosphate system (high intensity activity of 6-10 seconds); glycolytic system (moderate to high intensity activity of up to 90 seconds); aerobic system (low to moderate intensity of above 90 seconds); the energy continuum for intensity and duration; relative percentage contributions of energy systems during different activities.