Anatomy & Physiology
(Class 4)

- Ten (10) bodily systems
  - Skeletal
  - Muscular
  - Integumentary
  - Urinary
  - Endocrine
  - Digestive
  - Circulatory
  - Respiratory
  - Nervous
    - Includes special organs of sense
    - Reproductive

Gross Thoracic Anatomy

- Mediastinal structures
  - Heart
  - Parietal pericardium
  - Visceral pericardium
  - Aorta
  - Vena Cava
    - Superior
    - Inferior
  - Esophagus
  - Trachea
  - Carina
  - Proximal Mainstem Bronchi

- Thoracic Cavity Structures
  - Ribs
  - Pleura
    - Parietal
    - Visceral
  - Lungs (right lung has 3 lobes, left has 2)
  - Mainstem bronchi
  - Bronchi
  - Bronchioles
  - Terminal Bronchioles
  - Alveoli
- Superior diaphragm
- Anterior spinal column

- Structures underlying ribs, but not in chest
  - Kidneys
  - Spleen
  - Liver
  - Pancreas
  - Stomach
  - Inferior Diaphragm

Circulatory System

- Physiology
  - Movement of blood
    - Transport of nutrients
      - Sugars
      - Fats
      - Proteins
      - Minerals & salts
    - Transport of wastes
      - Nitrogen containing compounds
      - CO₂
    - Communication and Control
      - Hormones

- Two major components
  - Lymphatic system
    - Provides drainage of tissue fluids outside of the cardiovascular system
    - Eventually, fluid is dumped into circulatory system
    - Absorbs and transports fatty acids and fats
    - Production of immune cells
      - Monocytes
      - Lymphocytes
  - Cardiovascular system
    - Moves blood

- Heart
  - Visceral pericardium
    - Thin membranous covering on outer surface of heart
  - Parietal pericardium
    - Tough sac in which heart resides
    - Does not stretch
- Pericardial fluid
  - Reduces friction as heart moves (beats)

- Anatomy of the Heart (bloodflow)
  - Superior & Inferior Vena Cava
  - Right Atrium
  - Tricuspid valve
  - Right Ventricle
  - Pulmonic valve
  - Pulmonary artery
    - Only artery in adult circulation to carry deoxygenated blood
  - Pulmonary vein
    - Only vein in adult circulation to carry oxygenated blood
  - Left Atrium
  - Mitral Valve (Bicuspid valve)
  - Left Ventricle
  - Aortic valve
  - Aorta

- Bloodflow
  - Contraction
    - Right and left Atria contract simultaneously
    - Right and left Ventricles contract simultaneously
    - Ventricles always contract a few fractions of a second after the Atria
  - Blood type
    - Right Atria and Right Ventricle handle only deoxygenated blood
    - Left Atrium and left Ventricle handle only oxygenated blood

- Electrical anatomy of the Heart
  - Sinoatrial (SA) Node
    - 60 to 100 impulses per minute
  - Interatrial Tract (Bachmann’s Bundle)
  - Perkinje fibers
  - Internodal Tract
  - Atrioventricular (AV) Node
    - Captures & holds impulse momentarily
    - 40 to 60 impulses per minute
  - Bundle of His
  - Right & Left Bundle Branches
  - Perkinje fibers
    - <40 impulses per minute
- Vessels
  - Arteries
    - Smooth inner walls
    - High pressure
      - “Spurts”
    - Bright red blood
      - Freshly oxygenated
    - Lined with thick layer of smooth muscle
  - Arterioles
  - Capillaries
    - Extremely thin walls
    - Low pressure
      - “Oozes”
    - Darker red blood
      - Gas exchange
    - No muscular lining
  - Venules
  - Veins
    - Valves
      - Skeletal movement
    - High volume, Low pressure
      - “Flows”
    - Dark crimson color
    - Much thinner muscular lining than arteries

- Major Central Pulses
  - Carotid
    - Major artery of the neck
    - Located in natural valley between sternocleidomastoid muscle and trachea
    - Supplies the head with blood
    - Pulsations should be palpated on either side of the neck, particularly in elderly patients
  - Femoral
    - The major artery of the thigh
    - Located just lateral to the groin (the crease between the abdomen and thigh)
    - Supplies the lower extremities with blood
• Major Peripheral Pulses
  - Brachial
    • An artery of the upper arm
    • Pulsations can be palpated on the inside of the arm between the elbow and the shoulder
    • Used when determining a blood pressure (BP) using a BP cuff (sphygmomanometer) and a stethoscope
  - Radial
    • Major artery of the lower arm
    • Located at the thumb-side of the wrist
  - Posterior tibial (Posterior Tib)
    • An artery at the ankle
    • Located on the posterior surface of the medial malleolus
  - Dorsalis pedis (Pedal)
    • An artery in the foot
    • Located on the anterior surface of the foot

Respiratory System

• Physiology
  - Gas exchange
    • Oxygen (O₂)
    • Carbon Dioxide (CO₂)
  - Control of acid-base balance

• Lungs
  - Right
    • 3 major lobes
  - Left
    • 2 major lobes
      - Space to accommodate heart
  - Pleura
    • Parietal Pleura
      - Covers inside of chest wall
    • Visceral Pleura
- Covers outer surface of the lungs
  - Pleural fluid

  - Nose
    - Septum
    - Turbinates
    - Mucous
  - Mouth
  - Pharynx
    - Epiglottis
    - Glottic opening
  - Larynx
    - “Adams Apple”
    - Vocal cords

- Trachea
  - Carina
- Right & Left Mainstem Bronchi
- Bronchi
  - Primary
  - Secondary
  - Tertiary
- Bronchioles
- Terminal bronchioles
- Alveoli

Nervous System

- Physiology
  - Control of essentially all bodily functions through chemo-electrical activity

- Two Grand Divisions
  - Central Nervous System
    - Brain
    - Spinal Cord
  - Peripheral Nervous System
    - Sensory nerves
    - Motor nerves
Brain

- Protection
  - Scalp
  - Skull
  - Meninges
    - Layers
      - Dura (tough, leather-like)
      - Arachnoid (filmy with blood vessels)
      - Cerebro-spinal fluid (CSF)
      - Pia (filmy with blood vessels)
    - Meningitis
      - Inflammation
        - Bacterial
        - Viral
        - Fungal

- Two hemispheres
  - Right
    - nonverbal processing: spatial, musical, & visual tasks
  - Left
    - Verbal processing: language, speech, reading, & writing

- Layers
  - Cerebrum (Forebrain)
  - Cerebellum
  - Hind Brain

- Cerebrum (Forebrain)
  - Outermost layer
  - Divided into four lobes
    - Frontal
    - Parietal
    - Temporal
    - Occipital

- Frontal lobe
- Skeletal movement
- Thought
- Memory
- Personality
- Logic
- Behavior

• Parietal lobe
  - Speech
  - Hearing
• Temporal lobe
  - Hearing
  - Taste
  - Smell
• Occipital lobe
  - Sight

• Cerebellum (Mid-brain)
  - Underneath cerebrum
  - Functions
    • Cooperative muscle control
    • Coordination
    • Fine motor control
  • Hind brain
    - Pons
    - Glands
      • Hypothalamus
      • Thalamus
      • Pituitary
    - Medulla Oblongata
      • Major control center
      • Site of basal life support functions
        - Vomiting
        - Respiration
        - Blood pressure
        - Heart rate (influenced)

• Cranial nerves
  - Do NOT exit from spinal cord
  - Exit DIRECTLY from the brain
  - Twelve pairs
    • Olfactory
• Optic
• Oculomotor
• Trochlear
• Trigeminal
• Abducens
• Facial
• Vestibulocochlear
• Glossopharyngeal
• Vagus
• Spinal accessory
• Hypoglossal

Spinal Cord

• Spinal cord
  • Coverings
    – Vertebrae
    – Meninges
  • Extension of the brain
  • Center of reflexes

Peripheral Nervous System

• Spinal nerves (31 pairs)
  – Cervical (8 pairs)
  – Thoracic (12 pairs)
  – Lumbar (5 pairs)
  – Sacral (5 pairs)
  – Coccygeal (1 pair)
• Two nerve roots per nerve
  – Afferent (Sensory)
  – Efferent (Motor)
  – Both of the above join together a few centimeters away from the spinal cord
Functional Nervous System

- Voluntary
  - Skeletal movement
  - Requires conscious thought
- Involuntary
  - Organ and other unconscious movement
  - Sympathetic
    - "Fight or flight"
    - Speeds up bodily processes
  - Parasympathetic
    - "Vegetative"
    - Slows down bodily functions
    - Performs general housekeeping functions

Reproductive System

Female Reproductive Anatomy

- Organs continually present
  - Ovaries
    - Produce eggs
    - Lower abdomen
  - Fallopian tubes
    - Passage way for eggs
    - Connects ovaries to uterus
    - Vascular
    - Will not stretch
- Uterus
  - Expandable organ
  - Endometrium (inner lining)
  - Smooth muscle
  - Fetus matures within
  - Contracts to expel fetus
  - Cervix
    - Lower most portion of the uterus
    - "Neck" of the uterus
• Opening between uterus and vagina (Cervical os)
• Vagina
  – Birth canal

• Female anatomical structures present only during pregnancy
  – Developing human organism
    • Previous to fertilization
      – Zygote
    • Fertilization to 8 weeks gestation
      – Embryo
    • 8 weeks gestation to birth
      – Fetus

• Placenta
  – Disk shaped organ
  – Attached to uterine wall
  – Covers about 1/3 of the endometrium
  – Should attach to superior portion of uterus
  – Nourishes fetus
  – Vascular "interface"

• Umbilical cord
  • Connects fetus to placenta
    – 2 arteries (deoxygenated blood)
    – 1 vein (oxygenated blood)
  • Dimensions
    – About 2 feet in length
    – About 1 inch in diameter
  • Wharton's jelly
    – Protects vessels
  • Appearance of a "twisted cord"

• Amniotic sac (Bag of Waters or fetal membranes)
  – Thick, transparent sack
  – Encloses fetus
  – Protects fetus
- Contains fluid
  - Amniotic fluid
  - 500 cc to 1 liter

Male Reproductive Anatomy

- Male reproductive anatomy
  - Testes
    - Produces sperm
    - Produces certain male hormones
  - Scrotum
    - Encloses testes and regulates temperature
  - Vas Deferens
    - Collecting structure for sperm
    - Transport system for sperm

- Glandular accessory structures
  - Seminal Vesicle
  - Prostate
  - Bulbourethral gland
- Urethra
- Penis

- Physiology of reproduction
  - Zygote is fertilized in fallopian tube by sperm
  - Embryo implants in uterine wall (usually)
  - Above female structures develop
  - Embryo / fetus matures
  - Labor and Delivery