Respiratory System
Part 1: Respiratory Anatomy

Respiration

- Cardiopulmonary system
- Respiratory and conducting divisions
- Three processes
  1. Breathing
  2. Exchange of gases
  3. Use of oxygen

Respiration
- Pulmonary ventilation (breathing): movement of air into and out of the lungs
- External respiration: O\(_2\) and CO\(_2\) exchange between the lungs and the blood
- Transport: O\(_2\) and CO\(_2\) in the blood
- Internal respiration: O\(_2\) and CO\(_2\) exchange between systemic blood vessels and tissues

Functional Anatomy
- Structures
  - Nose
  - Pharynx
  - Larynx
  - Trachea
  - Lungs
  - Bronchial tree
  - Pleurae

Nose
- Functions
  - Provides an airway for respiration
  - Moistens and warms entering air
  - Filters and cleans inspired air
  - Resonating chamber for speech
  - Olfactory receptors
Figure 22.2a
Epicranius, frontal belly
Root and bridge of nose
Dorsum nasi
Ala of nose
Apex of nose
Naris (nostril)
Philtrum

(b) External skeletal framework
Frontal bone
Nasal bone
Septal cartilage
Maxillary bone (frontal process)
Lateral process of septal cartilage
Minor alar cartilages
Dense fibrous connective tissue
Major alar cartilages

Figure 22.2b
Frontal bone
Nasal bone
Septal cartilage
Maxillary bone (frontal process)
Lateral process of septal cartilage
Minor alar cartilages
Dense fibrous connective tissue
Major alar cartilages

Figure 22.3a
Sphenoid sinus
Frontal sinus
Nasal meatuses (superior, middle, and inferior)
Nasopharynx
Uvula
Palatine tonsil
Isthmus of the fauces
Posterior nasal aperture
Opening of pharyngotympanic tube
Pharynx
Nasopharynx
Oropharynx
Laryngopharynx

Figure 22.3b
Pharynx
Nasopharynx
Oropharynx
Laryngopharynx

Pharynx
• “Throat”
• Between internal nares and larynx
• Three regions
  1. Nasopharynx
  2. Oropharynx
  3. Laryngopharynx
Thought Questions

1. Name 2 functions of the nasal cavity.
2. Which pharyngeal region(s) would you expect to find stratified squamous epithelium and why?

Larynx

- Cartilage framework
  – Glottis
  – Epiglottis
- Functions
  1. Provides a patent airway
  2. Routes air and food into proper channels
  3. Sound production

Sound Production

- Vocal folds
  – Sound = vibration of folds
- Pitch
  – Tension of the vocal cords
- Loudness
  – Air pressure
Sound Production

- Chambers of pharynx, oral, nasal and sinus cavities amplify and enhance sound quality
- Sound is “shaped” into language by muscles of the pharynx, tongue, soft palate and lips

Trachea

- Windpipe
  - From the larynx into the mediastinum (membranous partition between the lungs)
- Smooth muscle and connective tissue
  - C-shaped cartilage rings

Lungs

- Left
  - 2 lobes
- Right
  - 3 lobes

Lungs and Bronchial Tree

(a) Cross section of the trachea and esophagus

(a) Anterior view. The lungs flank mediastinal structures laterally.
Bronchial Tree

- Trachea
  - Primary bronchi
    - Right bronchus
      - Shorter
      - Branches into 3 secondary bronchi
    - Left bronchus
      - Branches into 2 secondary bronchi

Bronchial Tree

- Trachea
  - Primary bronchi
  - Secondary bronchi
  - Tertiary bronchi
  - Bronchioles
  - Terminal bronchioles
  - Respiratory bronchioles
  - Alveoli

Alveoli

- Gas exchange
  - Large surface area + small diameter = high surface tension
    - Pulmonary surfactant
    - Infant respiratory distress syndrome

Alveoli

- Squamous epithelium with an elastic membrane
Pleurae

- Thin, double-layered serosa
  - Parietal pleura
    - Thoracic wall and superior face of diaphragm
  - Visceral pleura
    - External lung surface
- Pleural fluid
  - Lubrication

Pleurae

- Three functions
  1. Reduction of friction
  2. Pressure gradient
  3. Compartmentalization
  4. (Also cushioning and protection)

Fill in the blanks

External nares, nasal cavity → ___1___
___2___ trachea → ___3___
secondary bronchi → ___4___ bronchi
terminal bronchioles → ___5___
respiratory zone → ___6___
Word bank: respiratory bronchioles, larynx, tertiary, alveoli, bronchioles, primary bronchus, pharynx