

The Respiratory System

If you have not done so already, please print and bring to class the “Laboratory Practical II Preparation Guide”. We will begin using this shortly in preparation of your second laboratory Practical.

The respiratory exam may be divided into two smaller exams, if time permits. If it divided, part #1 will be up through “alveoli”. Part #2 will be from “lungs” to the end. This may not be possible but if we can we will do so.

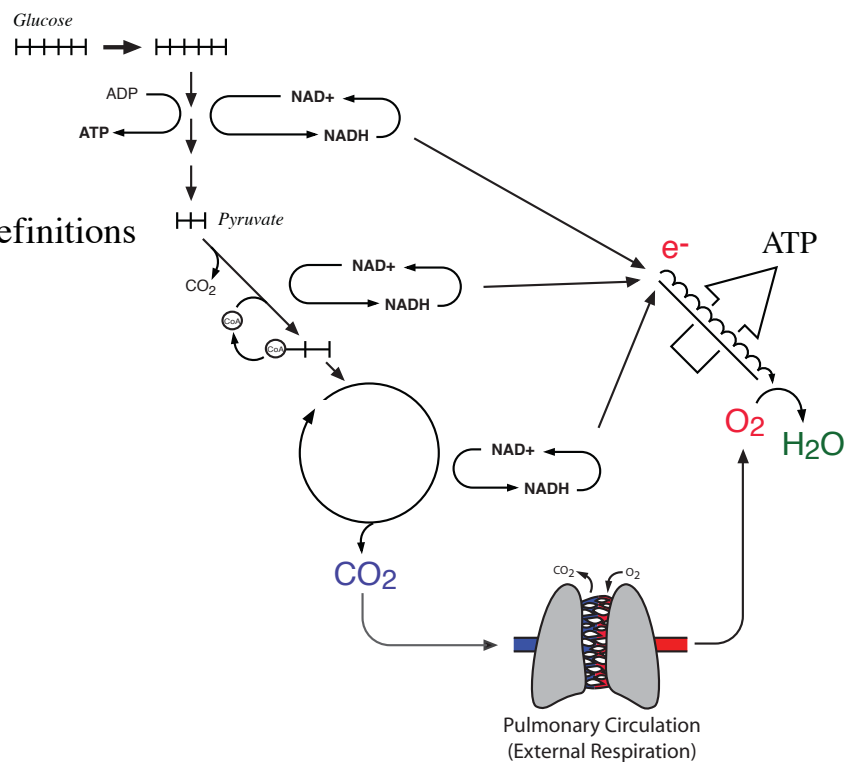
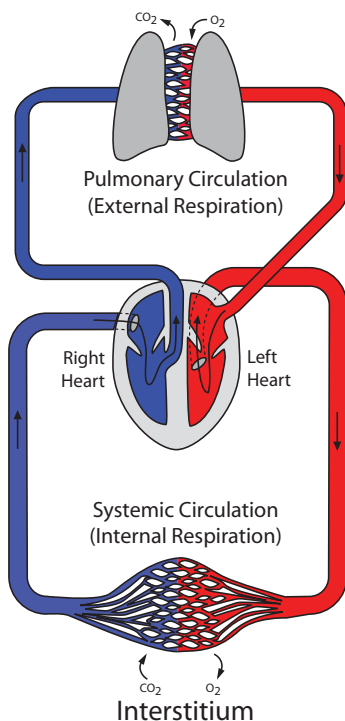
1. Introduction

- “Respiration” – Definitions

A. Cellular Respiration

B. External Respiration

C. Internal Respiration



D. Ventilation (Breathing)

i. Inspiration

ii. Expiration

2. Primary Function

A. Gas Exchange

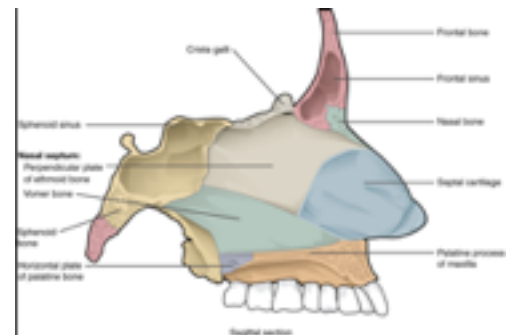
3. Secondary Functions
4. Anatomy of the Nasal Cavity and review of associated bony structures
 - A. Initial Overview
 - i. Internal and External Nares
 - ii. Nasal Septum
 - iii. Surface Area of the Nasal Cavity
 - Moisture Issues
 - iv. Paranasal Sinuses and Mucous Membrane
 - a. Frontal Sinus
 - b. Sphenoid Sinus
 - c. Ethmoidal Cells (or Sinuses)
 - d. Sphenoid Sinus
 - v. Mucous Membrane
 - a. Ciliated Pseudostratified Columnar Epithelia
 - Goblet Cells
 - vi. Nasolacrimal Duct

B. Bones and Structures Associated with Nasal Cavity

i. Nasal Bones

ii. Frontal Bone

- Frontal Sinus



iii. Nasal Septum

a. Perpendicular Plate of Ethmoid

b. Vomer

c. Septal Cartilage

- Hyaline Cartilage

iv. Surface Area Structures and Spaces

a. Ethmoid Bone

- Superior Nasal Concha

* Superior Meatus

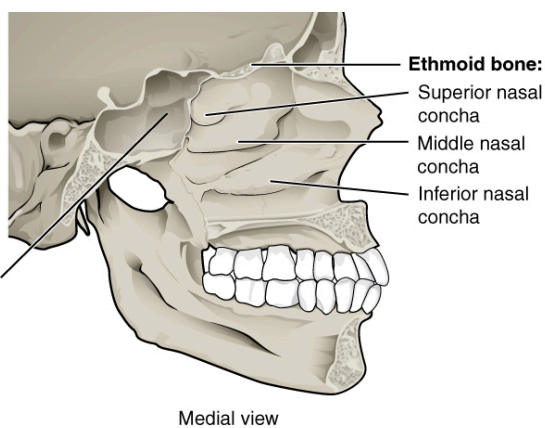
- Middle Nasal Concha

* Middle Meatus

Inferior Nasal Concha

- Inferior Nasal Concha

* Inferior Meatus



v. Hard Palate

a. Maxilla

- Palatine Process of Maxilla

b. Palatine Bone

- Horizontal Plate of Palatine Bone

vi. Soft Palate

vii. Olfactory Epithelia

a. Cribriform Plate of Ethmoid Bone

- Olfactory Foramina
- Olfactory Nerves and Processes

5. Pharynx

A. Nasopharynx

i. Eustachian Tube Function and Associated Structures

a. Orifice to Eustachian Tube

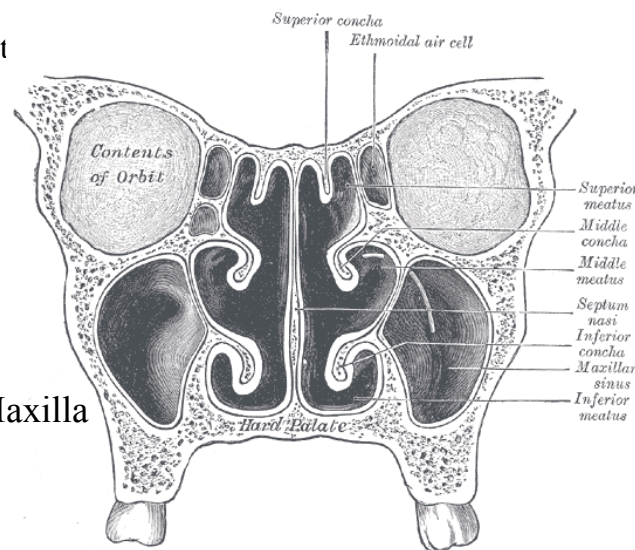
b. Pressure Issues and Inner Ear

ii. Pharyngeal Tonsils (Adenoids)

B. Oropharynx

i. Fauces

ii. Palatine Tonsil



- C. Laryngopharynx
 - i. Lingual tonsils
- 6. Larynx
 - A. Structural Cartilages
 - i. Thyroid Cartilage (Adam's apple)
 - ii. Cricoid Cartilage
 - ii. Arytenoid Cartilage
 - B. Hyoid Bone, and associated muscles and ligaments
 - C. Glottis
 - i. Epiglottis
 - D. Vocal Cords
 - E. Sound Production
- 7. Respiratory Tree
 - Conducting portion
 - Respiratory portion
 - Histology
 - A. Trachea
 - i. Tracheal "Rings"
 - B. Primary Bronchi
 - i. Lungs

Anatomy and Physiology II Student Outline – Respiratory System

- C. Secondary (lobar) Bronchi
 - i. Lobes of Lung
 - D. Tertiary (segmental) Bronchi
 - i. Bronchopulmonary Segments
 - E. Bronchioles
 - i. Lobules
8. Alveoli – The Functional Unit of the Respiratory System
- A. Anatomical Observations
 - i. Surface Area
 - B. Histology
 - i. Pulmonary Epithelia
 - ii. Endothelia
 - C. Surfactant and Physiological Concerns (See handout)
 - i. Septal Cells
 - a. Surfactant
 - a. Alveolar Sac
 - b. Septal Cells
 - Lung Surfactant
 - Alveolar Surface Tension
 - D. Alveolar Macrophage

9. Lungs

A. Location

- Thorax
- Mediastinum

B. Anatomy

i. Landmarks

- a. Apex
- b. Base

ii. Left Lung

- a. Superior, Inferior Lobes, and Cardiac Notch

iii. Right Lung

- a. Superior, Middle, and Inferior Lobes

iv. Bronchopulmonary Segments

v. Lobules

- a. Septa
- b. Elastic Connective Tissue

C. Pleural Cavity

- i. Visceral Pleura
- ii. Parietal Pleura

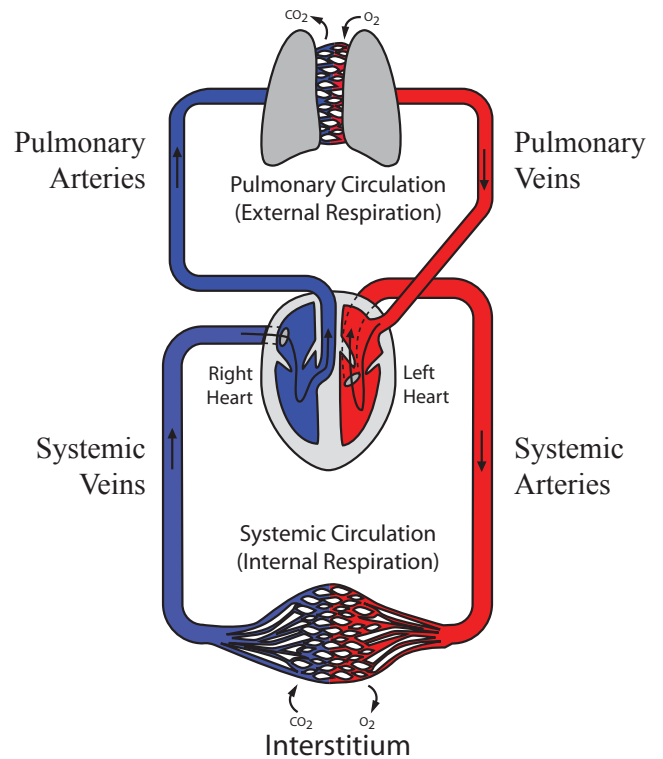
D. Lung Inflation and Pneumothorax (See Handout)

10. Nerve System

- A. Parasympathetic System
- B. Sympathetic System

11. Blood Supply

- A. Pulmonary Arteries & Veins
- B. Left and Right Atria
- C. Blood Flow
- D. Oxygenated and Deoxygenated



12. Breathing Mechanics

- Pulmonary Ventilation (Breathing)

A. Muscular Control of Breathing

- i. Inspiration
 - a. Diaphragm and External Intercostal
 - b. Diaphragm Contracts, Lowers Diaphragm
 - c. Abdominal Muscles
- ii. Expiration, Passive
 - a. External Intercostals & Diaphragm
 - b. Extrinsic Elastic Recoil
 - c. Intrinsic Elastic Recoil
- iii. Forced Expiration, Active

- a. Internal Intercostal Muscles
 - b. Abdominal Muscles
13. Factors Affecting Gas Movement and Solubility (See Handout)
 - External Respiration
 - Internal Respiration
 - A. Partial Pressure (Dalton's Law of Partial Pressure) (See Handout)
14. Gas Transport and Regulatory Concerns
 - A. Oxygen
 - Hemoglobin (H_g)
 - Oxyhemoglobin (HbO₂)
 - i. Temperature Effect (See graph in text)
 - ii. pH and Increased CO₂ and Acid Effect (See graph in text)
 - $\text{CO}_2 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{CO}_3 \rightarrow \text{H}^+ + \text{HCO}_3^-$
15. Carbon Dioxide (See illustration on handout)
 - A. Plasma
 - B. Carbaminohemoglobin
 - C. Bicarbonate Ion
16. Carbon Monoxide

17. Ventilation Control (See illustration on handout)

A. Medullary Rhythmicity Area (*See downloadable handout !!*)

i. Inspiratory Area

ii. Expiratory Area

Respiratory System “Short Stories”

Here is a list of “Short Stories” that are fun to learn and to share with others.

Don’t forget about all the anatomy: there was quite a bit and there will be one or more *surprise* anatomy diagram(s) on your exam!

Note: This list DOES NOT replace your lecture outline. The lecture outline, as usual, is the exam outline. The list below is merely to help you identify the “short stories” for efficient study and preparation.

List of “Short Stories”

SET #1:

- Olfactory Epithelium
- Eustachian (auditory) tube and pressure equalization
- Anatomy and function of the larynx. Sound production.
- Surfactant and Alveoli Structure

SET #2:

Anatomy and Physiology II Student Outline – Respiratory System

- Partial pressure and gas movement
- Environmental effects on hemoglobin carrying capacity (i.e. pH and temperature)
- Mechanics of Ventilation (not breathing)
- Lung “Inflation” and collapse
- CO₂ and O₂ exchange (see handout from blood lecture)