Respiratory Notes

A. **Nasal Cavity**

1. Nares
   external openings
2. Nasal septum
   partition dividing cavity
3. Hair keeps large particles out.
4. Mucus traps particles, carried to stomach, and digested.
5. Palate – separates from oral opening
6. Nasolacrimal ducts – carry tears from eyes

B. **Pharynx**

1. Both food and air.
2. Auditory Tubes – passageway from ear
3. Tonsils – role in immunity

C. **Larynx**

1. Adam's Apple (thyroid cartilage) Keeps passage way open for air
2. Epiglottis – flap of tissue, prevents food from entering the larynx.
3. Vocal chords – force of air = loudness, tension = pitch

D. **Trachea**

1. Lined mucous membranes serve to trap particles.
   Cilia propel it toward esophagus.
2. Cartilaginous rings hold it open.

E. **Bronchial Tree**

1. Begins with the two primary bronchi, each leading to a lung.
2. Bronchi break into smaller bronchi, then to bronchioles.
3. Bronchioles connect to alveolar ducts which terminate in alveoli.
4. Alveoli – site of gas exchange

F. **Lungs**

1. The right lung has three lobes, the left has two.
2. The visceral pleura is attached to the lung; parietal pleura lines the thoracic cavity; serous fluid lubricates between these two membranes.

✶ **Ventilation** ✶

A. Inspiration, Inhalation

1. Muscles involved - the diaphragm and the external intercostal muscles.
2. Atmospheric pressure is the force that moves air into the lungs.
3. Air pressure inside is decreased by increasing the volume of the thoracic cavity; due to surface tension between the two layers of pleura, the lungs follow with the chest wall and expand.
4. As the lungs expand, surfactant keeps the alveoli from sticking to each other so they do not collapse when internal air pressure is low.

B. Expiration, Exhalation

1. Muscles – Internal Intercostals, diaphragm relaxes
2. Decreased thoracic volume causes increase in pressure around the lungs
3. Air flows out.

C. Respiratory Air Volumes and Capacities

1. Spirometer – measures pulmonary volume
2. Tidal Volume – normal breath (500 mL)
3. Inspiratory Reserve Volume – amount that can be inspired above a normal breath (~3000 mL)
4. Expiratory Reserve Volume – amount that can be expired below a normal breath (~1100 mL)
5. Residual Volume – air still in lungs after a max. expiration. (~1200 mL)
6. IRV + TV = inspiratory capacity. Normal breath until Full (~3500 mL)
7. ERV + RV = functional reserve capacity. Everything beyond a normal breath (~2300 mL)
8. IRV + TV + ERV = Vital capacity
Max. exhale after Max. inhale (~4600 mL)
9. Total Lung Capacity = total volume (~5800mL)
10. Volumes and capacities are dependent on sex, age, body size, and health.

✶Rhythmic Ventilation ✶

A. Normal rate is 12-20/min.

B. controlled by neurons in the brain stem that tell muscles to contract

C. Receptors monitor pH (determined by CO_2 concentration) and O_2

✶Gas Exchanges ✶

A. Surrounding each alveolus are capillaries arranged so air is separated by a thin membrane from blood.

B. **Diffusion is influenced by:**

1. Respiratory membrane thickness – thinner = higher rate
2. Surface area – more = higher rate
3. Partial Pressure – more O_2 in air = higher rate
   - O_2 diffuses into the blood because there is more in air. (higher to lower concentration)
   - CO_2 diffuses out because more in blood than in air

✶Gas Transport ✶

A. Most O_2 (98.5%) binds on to hemoglobin, rest stays dissolved in plasma.

B. CO_2 will be dissolved in plasma, with hemoglobin, or as bicarbonate (most)