TRACHEA: lies anterior to esophagus, reinforced with hyaline cart. rings. Cilia beat upwards to remove debris. As it passes behind arch of aorta, branches to bronchi.

Repeated branching leads ultimately to terminal then respiratory bronchioles. Entire tract lined with pseudostratified ciliated columnar epith. (PCCE...)

LUNGS: (p. 842)
- Left: two lobes, superior (E) and inferior, cardiac notch (A), oblique fissure (B) (up to L)
- Right: three lobes, also has horizontal fissure (C) as well as oblique (up to R)

PLEURA: as before: visceral, parietal, cavity containing serous fluid adhere tightly due to negative pressure

ALVEOLI (P 844, 845)
- Respiratory membrane: double layer, endo and epithelium, 2 basal laminae fused (p 845)
- Surfactant (reduces surface tension) is produced which causes alveoli to open up at birth.
- Premature infants may have inadequate surfactant, resulting high surface tension leads to hyaline membrane disease

MECH OF BREATHING: ~500 mL enters and leaves per breath, 8000 mL/min
- Only 5% actually exchanged in alveoli per each breath
- Diaphragm contraction is the greatest contributor to inspiration (p 850)

Intercostal muscles also cause breathing. (p. 853):
- Exhale: internal intercostal muscles, pulls ribs down
- Inhale: external intercostal muscles, pulls ribs up

Inspiration: Phrenic nerve to diaphragm and external intercostal muscles (via intercostal nerves) to:

Exhalation: passive: elastic recoil
- Forceful: 1) internal intercostals
- 2) Serratus posterior
- 3) External and internal obliques
- 4) Rectus abdominis

LUNG VOLUMES: (p. 855)
- Residual: 1000-1200 mL
- Expiratory reserve: 800-1200 (beyond resting expiration)
- Tidal volume: 500 mL
- Inspiratory reserve: 2100-3000 (beyond resting inspiration)
- Vital capacity: 4800 (maximum air which can be expelled after deep breath)

Deep breathing: more efficient than shallow due to dead space in resp system.

REGULATION OF BREATHING:
- Respiratory center (P 868-869):
  - Medulla: dorsal respiratory group controls quiet breathing
  - Pons: apneustic triggers inspiration, pneumotaxic stimulates exhalation

Trigger for breathing: high CO2 forms carbonic acid, lowers pH, stimulates breathing. (Acidosis)
- Hemoglobin can transport CO2, carboxyhemoglobin.

RESPIRATORY PROBLEMS: (p 873)
- Cyanosis (“blue condition”) due to hypoxic hemoglobin, darker
- Emphysema (“an inflation”) breakdown of alveolar partitions. Sign: “barrel chested”
- Asthma (“panting”) constricted airways: hyper reactive due to histamine, etc
- Pneumothorax (“air chest”) air in the pleural space, causes collapsed lung.
- Cystic fibrosis thick mucus accumulates in lungs (inherited error in chloride transport)
- CO poisoning forms carboxyhemoglobin, cherry red, CO binds 200x more strongly than O2.