1. You should be able to explain the process of breathing: **what are the steps from breathing in to breathing out (name them!) and what occurs in each phase?**

   **Inspiration (IN)**
   - Diaphragm and intercostal muscles *contract*
   - The size of the thoracic cavity *increases*
   - Air is *pulled into the lungs* due to an increase in volume

   **Exhalation (OUT)**
   - A *passive process* which depends on natural lung elasticity
   - As muscles relax, air is pushed out of the lungs
   - *Forced expiration can occur* mostly by contracting internal intercostal muscles to depress the rib cage

2. **Describe the significance of oxygen and carbon dioxide in human cells.**
   - Oxygen is needed by the cells to turn glucose into ATP using cellular respiration
   - Carbon dioxide is produced as a byproduct of the reaction. It is a waste product that must be removed from the body.

3. **Explain the structure and function of mucous membranes that line most of the respiratory tract.**
   - **Structure:** pseudostratified ciliated columnar epithelium
   - **Function:** cilia move against the flow of air to capture dust, dirt, bacteria and other particles and move them out of the lungs.

4. **Locate the upper respiratory organs on a diagram, describe their structure and any specific functions they may have** (both respiratory and other functions, if applicable).
   - (functions for nasal conchae? - see #5   Sinuses? Epiglottis?)

   *See this website for practice with this:* [http://msjensen.cehd.umn.edu/webanatomy/respiratory/default.html](http://msjensen.cehd.umn.edu/webanatomy/respiratory/default.html)
   *You can also use this website:* [http://www.wiley.com/college/apcentral/anatomydrill/](http://www.wiley.com/college/apcentral/anatomydrill/)
   *(you will need to scroll down the page until you get to the Respiratory System)*

5. **What are the nasal conchae and how do they function?**
   - Projections from the sides of the nasal cavity
   - Increase surface area
   - Increase air turbulence within the nasal cavity

6. **Give the scientific name for the "Adam's Apple".**
   - Thyroid cartilage

7. **Locate the lower respiratory organs on a diagram, describe their structure and any specific functions they may have.**
   - See #5 for websites.

8. **Name the type of cartilage that composes the trachea.**
   - Hyaline cartilage
9. Distinguish between a primary, secondary, and tertiary bronchus. See image on the right.

10. Discuss the structure and function of the pleural membranes.
- double-layer membranes that surround the lungs
- space between the membranes is the pleural cavity (allows lungs to expand)
- membranes secrete a fluid to lubricate lung to protect surface during breathing.

11. What is a lobe? How many are in each lung?
A division on the lung
Right lung has 2 lobes, left lung has 3 lungs

12. Track a breath of air from the nose to an alveolus, noting what happens to the air as it meets each structure.
external nares → nasal cavity → nasopharynx → oropharynx → laryngopharynx → larynx → trachea → primary bronchi → secondary bronchii → tertiary bronchii → bronchioles → alveolar ducts → alveoli

13. Define the term surfactant and describe its important function.
Surfactant coats gas-exposed alveolar surfaces

14. Define the term pulmonary ventilation, and describe its two actions in terms of forces, muscles, and membranes involved.
Pulmonary ventilation – moving air in and out of the lungs
Actions: Inspiration (IN)
Diaphragm and intercostal muscles contract
The size of the thoracic cavity increases
Air is pulled into the lungs due to an increase in volume

Exhalation (OUT)
A passive process which depends on natural lung elasticity
As muscles relax, air is pushed out of the lungs
Forced expiration can occur mostly by contracting internal intercostal muscles to depress the rib cage

15. Starting with the diaphragm muscle in its relaxed position, describe, in order, the events that occur during inspiration. SEE # 14

16. OMIT

17. Define the term external respiration.
gas exchange between pulmonary blood and alveoli, occurs in the alveoli

18. List the percentages of N₂, O₂, and CO₂ in air.
air contains 78% Nitrogen, 21% oxygen, and 0.04% carbon dioxide

19. Define what is meant by the partial pressure (pp) of a gas in a mixture.
For this class, think of partial pressure in terms of concentration. If a gas has higher partial pressure in a location, it means there is more of that gas (higher concentration)
20. Discuss the factors that influence the rate at which a gas diffuses. (there are at least 4)
   OMIT

21. Define the term internal respiration.
    gas exchange between blood and tissue cells in systemic capillaries, occurs between tissue cells and red
    blood cells

22. Discuss how oxygen, carbon monoxide and carbon dioxide are transported in the blood. What is the most
    common method for each?
    Oxygen: almost all (98.5%) is carried by the red blood cells in hemoglobin (where it is bound to iron). A
    very small amount is dissolved in the blood plasma (1.5%).
    Carbon dioxide: can be bound to hemoglobin and carried by the red blood cells (23% is carried this way).
    Very little (7%) is in plasma as dissolved gas. Most is carried as bicarbonate ions in the plasma (70%).

23. Discuss the factors that cause oxygen to be released from hemoglobin.
    * Blood pH – as it lowers (become more acidic) oxygen is released;
    * Partial pressure oxygen – where oxygen concentration is low, less oxygen will be bound to hemoglobin it
      will release the oxygen to try to increase the levels in that area.
    * Partial pressure CO₂ – elevated CO₂ levels encourage oxygen to unload from hemoglobin
    * Temperature – as temperature increases oxygen is unloaded more easily so that more oxygen can be loaded
      in the lungs and brought to active areas.

24. Explain how respiration is affected by varying chemical (CO₂ and O₂) concentration in the blood.
    Increases in CO₂ levels lead to an increase in rate and depth of breathing.
    Significant drop in O₂ will cause increase in breathing.
    As H⁺ increases in the plasma, breathing increases (attempt to eliminate carbonic acid from the blood)

25. Define the term hypoxia, and describe how it occurs during carbon monoxide poisoning.
    Hypoxia is when the body is receiving an inadequate oxygen supply. Carbon monoxide preferentially binds
    to hemoglobin compared to oxygen and carbon dioxide. As a result, oxygen cannot be released to the cells
    that need it (causing hypoxia).

26. What are the 5 homeostatic imbalances?
    - review this set of notes, keeping in mind this information will be asked as multiple choice, matching or
      completion!