1. Air enters the nasal cavity through the external (1)_________. The nasal cavity is divided by the midline bony (2)_________. Three functions of the mucosa are to (3)_________. ________________, _________the incoming air. Mucous membrane lined cavities (spaces) called (4)_________ are located in several bones surrounding the nasal cavity. The (5)_________ connects the nasal cavity with the larynx. Clusters of lymphatic tissue called (6)_________ are found in the nasopharynx. Reinforcement of the trachea with (7)_________ rings prevents its collapse. The largest cartilage of the larynx is the (8)_________. Within the larynx are the (9)_________ with vibrate with exhaled air and allow an individual to produce (10)_________.

Answer: 1) nares 2) septum 3) warm, filter, humidify 4) sinuses 5) pharynx 6) tonsils 7) cartilage 8) thyroid cartilage 9) vocal cord (folds) 10) sound

2. What is the difference between ventilation and respiration (briefly)?
Ventilation consists of inspiration and expiration (breathing) while respiration (internal and external) is the exchange of gases

3. Match the tissue or cell type

| Secretes surfactant | A. nasal mucosal epithelium |
| Lines mucus escalator | B. macrophage |
| Patrols alveoli for foreign material | C. capillary simple squamous epithelium |
| Tissue found in bronchioles | D. alveolar and capillary epithelium together |
| Form the respiratory membrane | E. Type I cells |
| Forms the bridge of the nose | F. Type II cells |
| Also known as endothelium | G. Bone tissue |
| Cells form walls of the alveoli | H. pseudostratified ciliated columnar epithelium |
| Contains olfactory receptors | I. smooth muscle |
| Tissue that forms rings of trachea | J. hyaline cartilage |
| Expands the thoracic cavity | K. diaphragm and external intercostals |


4. Use these choices to fill in:

A. Alveoli | D. Epiglottis | G. Palate | J. Primary bronchi |
B. Bronchioles | E. Esophagus | H. Parietal pleura | K. Trachea |
C. Conchae | F. Glottis | I. Phrenic nerve | L. Visceral pleura |
| M. Pharynx |

5. Label:
Trachea  Alveoli  Pharynx  Left lung
Larynx  Tertiary bronchi  Right lung
Nasal cavity  Secondary bronchi  Diaphragm
Oral cavity  Primary bronchi  Visceral pleura

a. Identify the conducting portion of the respiratory system ________________________

b. Identify the respiratory portion ________________________

c. List one structure composed of muscle diaphragm

d. List 4 structures that contain cartilage larynx, trachea, primary bronchi, secondary bronchi

e. List 2 structures that normally produce mucus nasal cavity, trachea

f. List one structure that is shared with the digestive system pharynx

g. Which structure contains:
   conchae  nasal cavity
   surfactant  alveoli
   a mucus escalator  trachea
   olfactory receptors  nasal cavity
   pseudostratified ciliated columnar epithelium  trachea, nasal cavity
   right lung
   3 lobes
   C-shaped cartilage rings
   a cardiac notch  trachea
   the epiglottis  larynx
   an oblique fissure  right lung
   vocal cords  larynx
   the carina (did not cover in this unit)
   simple squamous epithelium  alveoli
   nares  nasal cavity
6. What do the following values refer to (#s 1 – 14)?

**Word bank**
- A. pressure of air in lungs when diaphragm contracts
- B. pressure of air in lungs during expiration
- C. atmospheric pressure at sea level
- D. partial pressure of oxygen in venous capillaries
- E. partial pressure of oxygen in alveoli at inspiration
- F. amount of air that is oxygen
- G. amount of air that is carbon dioxide
- H. respiratory minute volume
- I. respiratory rate
- J. tidal volume
- K. vital capacity
- L. transported at bicarbonate ions
- M. amount of hemoglobin that is saturated with oxygen upon inspiration
- N. amount of oxygen transported dissolved in plasma

1. 21%
2. 0.04%
3. 97%
4. TV + IRV + ERV =
5. 12 – 18 /minute
6. 1.5%
7. 100 mm Hg
8. 70%
9. 40 mmHg
10. 500 ml of air
11. 6000 ml/min at rest
12. 762 mmHg
13. 759 mm Hg
14. 760 mmHg

**Answer:** 1F, 2 G, 3M, 4 K, 5I, 6N, 7E, 8L, 9D, 10J, 11H, 12B, 13A, 14C

7. Match
a. partial pressure ___ 760 mmHg at sea level
b. atmospheric pressure ___ depends on concentration of H+ ions
c. diffusion ___ 1.5% oxygen transported in blood this way
d. Bohr effect ___ increase volume → lower pressure
e. lipid solubility ___ promotes dissociation of O2 from Hb on rbc
f. hemoglobin saturation ___ allows gases to cross cell membranes
g. pH ___ enzyme converts CO₂ and H₂O to bicarb ions and H+ ions
h. Boyle’s Law ___ as H+ ions increase in blood, oxygen dissociates from Hb
i. Dalton's Law ___ oxygen's at sea level is 160 mmHg
j. Temperature ___ 97.5 % when pO₂ = 100 mm
k. carbonic anhydrase ___ net movement of gas molecules from high to low concentration
l. in plasma ___ add up partial pressures of gas to reach atmospheric pressure

**Answer:** b, g, l, h, j, e, omit (k), omit (d), a, f, c, i
8. Clinical considerations: Match

- lymphatic tissue swells to interfere with swallowing
- tube inserted through glottis into airways
- bronchiole smooth muscle constricts and narrows airway
- surfactant not secreted so that alveoli don't recoil
- lung collapses when air pressure is equivalent to atmospheric
- nitrogen becomes soluble in blood at depths below sea level
- abnormal breathing
- less than 87% Hb saturation because of low PO2
- Hb preferentially binds CO instead of O2
- problem in the infant's respiratory control center of brain
- intubation

A. SIDS
B. Asthma
C. Carbon monoxide poisoning
D. Dyspnea
E. Hypoxia
F. Respiratory distress syndrome
G. Decompression sickness
H. Pneumothorax
I. Tonsillitis
J. Intubation

Answer: I, J, B, F, H, G, D, E, C, A

9. Fill in:
Most oxygen is transported bound to _______________ on red blood cells. Most carbon dioxide is carried in the form of _______________. Carbon monoxide poisoning is lethal because it competes with _____________ for binding sites

Answer: hemoglobin, bicarbonate ion (HCO3-), oxygen

10. Arrange according to size (largest to smallest)

trachea  bronchiole  Type I cell  alveoli  tertiary bronchi  oxygen molecule

Correct order: trachea, tertiary bronchi, bronchiole, alveoli, Type I cell, oxygen molecule

11. Use these choices to fill in:

Active transport  Diffusion
Air of alveoli to capillary blood  Higher concentration
Carbon dioxide-poor and oxygen-rich  Lower concentration
Capillary blood to alveolar air  Oxygen-poor and carbon dioxide-rich
Capillary blood to tissue cells  Tissue cells to capillary blood

All gas exchanges are made by the process of _______________. When substances pass in this manner, they move from an area of ___________________ to an area of ___________________. Thus, oxygen continually passes from the ___________________ and then from the ___________________. Conversely, carbon dioxide moves from the ___________________ and from ___________________. From there, it passes out of the body during expiration. As a result of such exchanges, arterial blood tends to be ___________________ while venous blood is ___________________.

Answer: diffusion, higher concentration, lower concentration, air of alveoli to capillary blood, capillary blood to tissue cells, tissue cells to capillary blood, capillary blood to alveolar air, carbon dioxide-poor and oxygen rich, oxygen poor and carbon dioxide rich