

Respiratory System (BMS 333) 2024/2025

Midterm Exam - Key

Which of the following matches between the respiratory tract structure and type of epithelium is NOT correct?

Alveolar duct – simple columnar

Which of the following histological features is NOT evident in the respiratory component of the nasal cavity compared to larynx?

Skeletal muscles

Which of the following structures is the most anteriorly located at the level of the superior thoracic aperture?

Subclavian vein

Which of the following structures correctly matched with its bypassing area at the diaphragm?

Subcostal nerve – Lateral arcuate ligament

Which of the following joints has the least mobility?

Which of the following is a key pathological feature of emphysema in COPD?

Destruction of alveolar walls and enlargement of air spaces

A 55-year-old man is admitted to the hospital with increasing shortness of breath and dry cough for the past few years. He smokes 1.5 packs of cigarettes. He is constantly “gasping for air” and now walks with difficulty because he becomes breathless after only a few steps. Prolonged expiration with wheezing is noted. Physical examination shows a barrel chest. The patient’s face is puffy and red, and he has pitting edema of the legs. A chest X-ray discloses hyperinflation, flattening of the diaphragm, and increased retrosternal air space. Which of the following is the appropriate diagnosis?

Emphysema

Regarding atelectasis types, all the following is TRUE EXCEPT:

Pleural effusion results in resorption atelectasis

Which of the following findings is most suggestive of acute respiratory distress syndrome (ARDS) / diffuse alveolar damage (DAD)?

Hyaline membranes

Which pulmonary function test (PFT) parameter is typically reduced in restrictive lung diseases?

Forced vital capacity (FVC)

It is so important to diagnose a Streptococcal sore throat because:

non-suppurative sequelae can be prevented with antibiotics

How would you test for a bacterial cause for sore throat?

throat swab and culture on blood agar

The most common cause of acute epiglottitis is:

Haemophilus influenzae

Cervical adenitis and edema produce a “bullneck” appearance in severe cases
of:

Diphtheria

This virus is a single-stranded RNA orthomyxovirus. Annual vaccination
is necessary because of antigenic drift and shift.

Influenza virus

An accumulation of hydrogen peroxide in a cellular compartment can be
converted to dangerous radical forms in the presence of which metal?

Iron

A patient with chronic granulomatous disease, who is complaining of fever, dermatitis, and diarrhea, is seen in your clinic. The genetic form of this disease results in the inability to generate Superoxide, because of mutations in:

NADPH oxidase.

If you wear a face mask for several hours, you are expected to experience:

Respiratory acidosis

Which one of the following drug-mechanism of action in treating asthma is TRUE?

Cromolyn - inhibits mast cell degranulation and release of histamine

Which one of the following is TRUE regarding leukotrienes modifiers?

In asthma, according to GINA guideline 2024, what is the preferred step 2 controller-reliever treatment (from the following)?

As needed only low-dose ICS+formoterol

A 24-year young male has difficulty with breathing through his nose. On examination, his physician finds that he has swelling of the mucous membranes of the space above the superior concha. Which opening of the paranasal sinuses is most likely plugged?

Sphenoidal sinus

Select the wrong statement regarding the Little's Area (Kiesselbach's Area):

The arterial anastomoses of Little's area located above the middle concha

Following a diagnosis of surgical injury of the left superior laryngeal nerve, which of the following additional abnormal findings would be expected in this nerve injury?

Decreased/absent sensation above the vocal folds

A 3-year-old child swallowed a small foreign particle. The most likely scenario for the particle on the way down the trachea was to hit the and enter directly into the bronchus.

Carina; Right

The lower border of the pleural cavity at the midaxillary line lies at level of:

Tenth rib

When viewing the hilum, how can you determine which lung you are looking at?

In the left lung, the artery is superior to the bronchus

Total physiology questions: 9 out of 36

For each question there is an answer and an explanation, the explanation is from the doctor himself and a little bit from the writer of these msgs here

—

1. Tidal volume:

- (A) Has pure oxygen
- (B) It is the volume after the the end of the inspiration
- (C) It is the volume after the end of a maximal expiration
- (D) It the flow of air in and out per respiration cycle

—

Answer: D

Explanation: (A) is false because a portion of the inspired oxygenated air becomes trapped in the humidified dead space, which dilutes the overall oxygen content of the inspired air. (B) It is not indicative of the tidal volume in general. (C) It is not the tidal volume but it is the residual volume.

2. Most important variable in pulmonary blood flow to the lower lobes of the lungs:

- (A) O₂ concentration in the blood
- (B) O₂ concentration in the alveoli
- (C) Pressure of CO₂ in the alveoli
- (D) Weight of the lungs
- (E) Arterial and venous different pressure

—

Answer: E

Explanation: Inside the vessel system, the main contributing driving force is logically the arterial-venous difference in pressure.

3. If V/Q is zero:

(A) Blood leaving the capillary from that lobe will have PO_2 similar to the trachea at the end of expiration

(B) Blood leaving the capillary from that lobe will have PO_2 similar to the trachea at the end of inspiration

(C) No change in the capillary PCO_2

(D) PCO_2 and PO_2 normal as a healthy person

Answer: C

Explanation: Shunted blood.

Neither (A) nor (B) are correct, (D) is also incorrect as this is seen in pathological conditions only.

4. Sequence of O₂ concentration:

Answer: Atmosphere then tracheal dead space then alveoli then the beginning of the alveolar capillary

Explanation:

The higher the concentration of oxygen the more the partial pressure this gas will cause in the surrounding space.

As we mentioned, the atmospheric O₂ pressure has the highest oxygen pressure which is about 160 mmHg (~159 for reference), followed by the trachea (which in such place, the air will be humidified, diluting the amount of P_{AO2} down to about 150 mmHg (~149 for reference), then, at the alveoli (~100 mmHg) and lastly, the beginning of the alveolar capillary (~40 mmHg, venous blood).

5. Surfactant deficiency:

Answer: Alveolar collapse

Explanation: Surfactant prevents the pulmonary edema and controls/prevents the filtration of the pulmonary capillaries into the interstitial space, as most of the options were related to the opposite, indicating a decrease in the filtration or edema formation rate, which is false in the case of surfactant deficiency.

6. Pulmonary blood flow correct statement:

- (A) High pressure circulation is characterized to have the same amount of systematic blood flow
- (B) All flow end in the RT atrium
- (C) High pressure circulation end in the RT atrium
- (D) Low pressure end in the RT atrium
- (E) Most of blood flow is going through the low pressure circulation

Answer: E

Explanation: (A) is false because the bronchial tree, which supplies the supporting tissues of the lungs and the parenchyma of the surrounding lung tissue, receives only about 1%-2% of the cardiac output directly from the systemic circulation. (B) is false because the pulmonary flow, along with the bronchial deoxygenated flow, empties into the left atrium and then into the left ventricle, not the right. (C) and (D) are also false for the same reason mentioned in option (B). The final option (E), is correct because most of the pulmonary flow passes through the “high-flow, low-pressure circulation.”

7. Regarding airway resistance:

(A) Systematic stimulation will increase the airway resistance

(B) Increasing in alveoli O_2 will increase bronchial tree resistance

(C) Status of larger bronchiole & bronchi near the trachea

Answer: C

Explanation: The airway will be dilated to allow for more oxygen entry from the atmosphere to the lungs during sympathetic stimulation (in a fight-or-flight situation), which in common sense will serve the function, that is supplying the body with more oxygen so it can oxidize it and produce more energy. Dilating the airways reduces airway resistance, contrary to what is stated in option (A). Option (B) is incorrect, as one will notice the “bronchial tree” statement. In the normal (physiological) conditions, the PO_2 effect/alter the resistance of the alveolar arteries not “bronchial tree” themselves, which again, serves the purpose of the lungs, that is to supply oxygen, because there is no purpose for the deoxygenated blood to go into an alveoli that is not saturated with oxygen. Option (C) is correct because the lesser the number of branches of the bronchial tree proximally, the easier it will be to control the diameter of those branches compared to the distally located, highly branched bronchial tree.

8. Regrading anemia:

- (A) Hb-disassociation curve shift to left
- (B) Hb-disassociation curve shift to right
- (C) Hb will have higher affinity for O₂
- (D) Gram of Hb will bind to less amount of ml's of oxygen
- (E) Certain volumes of blood will carry few amounts of oxygen

Answer: E

Explanation: Option (A), (B) and (C) are incorrect since anemia doesn't affect the hemoglobin affinity binding to oxygen, and so shifting of this curve won't/shouldn't happen, opposite to both options (A) and (B). Recalling from the last lecture, the factors that causes a shift in the Hb-disassociation curve are: CO₂, and H⁺ concentrations, BPG and the temperature of the blood. Option (D) is again, incorrect, In anemia, it is true that the concentration of hemoglobin is lower, but each gram of hemoglobin still binds to 1.34 milliliters of oxygen because the affinity of hemoglobin isn't affected. All of this should lead us to the last option that is, correct. The blood will carry less milliliters of oxygen in certain volumes of blood due to the lesser amount of hemoglobin.

9. During forced expiration:

- (A) Rate of airflow is consistent
- (B) Alveoli will collapse
- (C) Alveoli pressure increases at first and keep rising
- (D) During the forced expiration, the atmospheric pressure is 0 cm/H₂O

Answer: D

Explanation: During forced expiration, the bronchial tree will generally narrow to a certain extent to expel the air out of the lungs, as this is happening, the expired air will flow into the outside in a faster rate through that narrowed path, which is different from what mentioned in option (A). In a healthy person, the alveoli never collapse, even in a forced expiration, this is achieved by the supporting structures surrounding the alveoli, and the role of surfactant in reducing the water-surface tension, as this explains why option (B) isn't correct. Option (C) is false, the alveolar pressure during forced expiration will rise but eventually will decrease after the forced expiration, not "keep rising" as mentioned. The last option, (D) is correct, as the atmospheric pressure stay consistent no matter what, unless in some situations where we may have a high pressurized room or etc....