Last Year's Resp. exam:

1. lack of O_2 equilibration due to:
   - Diffusion limitation.

2. alveolar capillary block can be evaluated by:
   - Diffusion capacity of the lung. (diffusion capacity of CO.)

3. patient with inadequate surfactant (RDS) will have relatively normal:
   - FEV_1/FVC.

4. all the following true concerning surfactant except:
   - 80% of its contents .....
     ↳ not 80% (It is 90%) and primarily consists of phospholipids.

5. Before inspiration alveolar P. = 0, Intrapleural P. = -4, at the end of inspiration:
   - alveolar P. = 0 / Intrapleural P. = -6

6. During moderate exercise (not severe) pulmonary vascular Resistance, except:
   - increases. (it doesn't increase).

7. match the following with the letter indicating the most apropriate answer:
   $PO_2 = 116$, $PCO_2 = 28$ ⇒ in mixed expired air

8. Calculate the alveolar ventilation:
   can't be calculated (You shouldn't assume, You have data then you can use it)
   (You don't know the anatomical dead space.).

9. patient with no respiratory problems is given blood transfusion, which of the following will occur?
   - arterial PO_2 will increase (X)
   - arterial PCO_2 will decrease (X)
   - arterial saturation will increase (no more than 100%) (X)
   - O_2 carrying capacity of the blood will decrease (X) → will increase.
   - arterial O_2 content will increase (✓)

   * one with bleeding:
     - P_aO_2 → remains the same (but it might be slightly increased due to hyperventilation)
     - O_2 saturation → the same
     - arterial O_2 content will decrease (✓)
     - venous O_2 content will decrease (✓)
     - Extraction ratio will increase (✓)
       (before he was taking 5 from 20, no (after bleeding) taking 5 from 10.

10. acute hemorrhage causes reduction in Hb to 60% in otherwise healthy individual the alveolar ventilation and the O_2 consumption rates remain the same as before the hemorrhage, which of the following will occur after the hemorrhage:

- normal arterial PO_2, low venous PO_2

11. 9-Years old patient decided to find out how long he could breath into and out of a bag, after 2min his friends noticed that he was breathing very rapidly and forced him to stop, what is the cause of hyperventilation?

- Increased P_aCO_2

12. which of the following conditions would be expected to stimulate the arterial chemoreceptors:

- Hypoxia due to ascending to high altitudes.

13. which parameters decrease with emphysema:

- Diffusion area.

14. person suffers from stab injury and air entered ------

- when pneumothorax → collapse of the lung → venous return will decrease significantly,

so the person will die from decreased venous return before dying from the collapse.

15. person ascended to a top of a mountain where the atmospheric p. is below 9 ------

- Hypoxia and $\underbrace{\text{hypocapnia}}_{<40}$ (ventilating too much, washing out CO_2)

16. The following question refers to measurement taken in male, with age of 25y, at rest, indicating that the value given for in particular measurement is above the value that would be expected in normal subject:

- RU = 2.5 L → this is too much.

17. The O_2 consumption of the respiratory muscle is decreased by:

- a decrease in airway resistance.

18. compared to basal region, the apical region has:

- lower PCO_2

19. largest alveolar arterial gradient ---- in:

- fibrosis.

20. what limits PO_2 of the lungs:

- cardio vascular system

21. hyperventilating allows one to hold his breath for a longer period of time because:

- hyperventilation removes CO_2 (not adding more O_2)

22. What would be expected effect of pulmonary edema on pulmonary diffusion capacity for O_2

- reduce diffusion capacity for O_2 & CO_2

23. Regarding residual volume represents except :

- The resting volume of the lung (It is the minimal volume which represents the resting volume)

- Which of the following will return toward normal few weeks following ascending to high altitude (and stay at the top of the mountain)?:
o Arterial hydrogen ion concentration ***
o Arterial carbon dioxide tension
o Arterial bicarbonate ion concentration
o Arterial hemoglobin concentration
o Alveolar ventilation
- Which of the following is most likely cause of a high arterial PCO2?
o Increased metabolic activity during exercise
o Increased alveolar dead space volume
o Depressed medullary respiratory centers ***
o Alveolar capillary block
o Increased alveolar ventilation
- Which of the following statements characterize pulmonary compliance?
o Increases during emphysema
- Which of the following shifts the oxyhemoglobin curve to the left?
o Increased temperature
o Exercise
o Hyperventilation ***
o Metabolic acidosis
- Which of the following has to be less in the fetus than in the mother?
o PaCO2
o Pulmonary vascular resistance
o Affinity to hemoglobin
o PaO2 ***
o Arterial hydrogen ion concentration
- Lack of oxygen equilibration due to diffusion limitation (in alveolar capillary block) can be evaluated by measuring
o Diffusion capacity of CO ***
o Diffusion capacity of CO2
o Diffusion capacity of N2

Past paper questions:

(The ones I managed to understand, the others are not clear). I will attach the pictures at the end of this document:

- Which of the following will return toward normal few weeks following ascending to high altitude (and stay at the top of the mountain)?:
    - **Arterial hydrogen ion concentration**
    - Arterial carbon dioxide tension
    - Arterial bicarbonate ion concentration
    - Arterial hemoglobin concentration
    - Alveolar ventilation
- Which of the following is most likely cause of a high arterial PCO2?
    - Increased metabolic activity during exercise
    - Increased alveolar dead space volume
    - **Depressed medullary respiratory centers**
    - Alveolar capillary block
    - Increased alveolar ventilation

- Which of the following statements characterize pulmonary compliance?
    - **Increases during emphysema**
- Which of the following shifts the oxyhemoglobin curve to the left?
    - Increased temperature
    - Exercise
    - **Hyperventilation**
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- Which of the following has to be less in the fetus than in the mother?
    - PaCO2
    - Pulmonary vascular resistance
    - Affinity to hemoglobin
    - **PaO2**
    - Arterial hydrogen ion concentration
- Lack of oxygen equilibration due to diffusion limitation (in alveolar capillary block) can be evaluated by measuring
    - **Diffusion capacity of CO**
    - Diffusion capacity of CO2
    - Diffusion capacity of N2

[illegible] residual volume

c- normal FEV1/FVC

d- increased lung compliance

e- decreased peak expiratory flow corrected for lung volume 22

37- In diving, divers first hyperventilate before they go into water. This hyperventilation allows one to hold one's breath for a longer period of time because hyperventilation:

a- increases the oxygen reserve of systemic arterial blood

b- decreases the PCO_2 of systemic arterial blood

c- increases the pH of systemic arterial blood

d- increases brain blood flow

e- makes alveolar air full of CO_2 which divers can use while diving 23

38- In an infant with persistent pulmonary hypertension, oxygen delivery to the tissues may be inadequate at birth because of:

a- An increase in hemoglobin concentrations

b- The presence of an acidosis

c- A decrease in the number of tissue capillaries

d- The presence of a normal arterial P_{CO_2}

e- The presence of a lower-than-normal arterial P_{CO_2}

39- The extra-vascular PO_2 difference of the carotid bodies is small because:

a- carotid bodies are metabolically inactive.

b- The blood supplying the carotid bodies is extremely high

c- carotid bodies blood flow is equal to 20 **[illegible] tissue weight.**

d- carotid bodies receive venous blood and not arterial blood.

e- O_2 extraction ratio is the highest when compared to other tissues 15

40- The elastic strength of the lungs is less than the elastic strength of the chest wall at all volumes.

a- within the vital capacity range

b- less than the total lung capacity

c- at the vital capacity range

d- greater than the residual volume

e- less than the functional residual capacity.

Use the respiratory data below to answer the following question.

In a person breathing room air at sea level, the following data were obtained.

Tidal volume	= 400 ml
Dead space volume	= 100 ml
Breathing frequency	= 10 breaths/min
PaCO2 (p-arterial)	= 50 mmHg

41- If the patient doubles his tidal volume without changing his CO2 production, his PaCO2 will be about:

0.2% 0.2% 30 34 5 29 8

a- 10 mmHg

b- 20 mmHg 10

c- **25 mmHg** **54**

d- 30 mmHg 9

e- 35 mmHg 20

42- A person ascends to the top of a mountain where the atmospheric pressure is below normal. Which one of the following arterial blood gases was drawn from the person at the top of the mountain?

0.71 0.73 63 15 11 3 2 6

	PO_2	PCO_2	
a-	**50**		
b-	60	30	**63**
c-	60	40	13
d-	100	50	11
e-	150	60	3
		70	2

43- Choose the statement that [illegible] in a normal person breathing 100% O2 [illegible]

0.67 0.8 [illegible] 18

a- [illegible] around [illegible] CO2

b- [illegible] contains only O2

c- it is always safe to breath 100% O2 [illegible]

d- the PO2 in systemic [illegible] 149 mm Hg

e- **dissolved O2 remains less than bound O2 in this indi[illegible]**

44- In [illegible] individual, the conducting zone of the lung:

0.95 [illegible]

a- accounts for more than 100% of the total lung capacity

b- contains alveoli only at bronchioles

c- provides [illegible] volume when compared to resp[illegible]

d- **receives its blood supply from [illegible] arteries.**

e- [illegible]

The end

Past paper questions: (The answers are from the website not me)

1) Which of the following will return toward normal few weeks following ascending to high altitude (and stay at the top of the mountain)?:

- **Arterial hydrogen ion concentration**
- Arterial carbon dioxide tension
- Arterial bicarbonate ion concentration
- Arterial hemoglobin concentration
- Alveolar ventilation

2) Which of the following is most likely cause of a high arterial PCO2?

- o Increased metabolic activity during exercise
- o Increased alveolar dead space volume
- o **Depressed medullary respiratory centers**
- o Alveolar capillary block
- o Increased alveolar ventilation

3) What happens to arterial blood gases after a period of hyperventilation: >>> **increase Po2, decrease Pco2, no change PH2o**

4) Hyperventilation can result from:
a- **increase alveolar Pco2**
b- increase alveolar Po2
c- decrease arterial Pco2 below 30 mmHg Lejan 2009/2010
d- direct stimulation of central chemosensitive receptors due to increase PH
e- a decline of arterial Po2 from 100 mmHg to 70 mmHg

BRS Physiology questions:

19) Hypoxemia produces hyperventilation by a direct effect on the:

(A) phrenic nerve (B) J receptors (C) lung stretch receptors (D) medullary chemoreceptors (E) carotid and aortic body chemoreceptors

20) Which of the following changes occurs during strenuous exercise?

(A) Ventilation rate and O2 consumption increase to the same extent (B) Systemic arterial Po2 decreases to about 70 mm Hg (C) Systemic arterial Pco2 increases to about 60 mm Hg (D) Systemic venous Pco2 decreases to about 20 mm Hg (E) Pulmonary blood flow decreases at the expense of systemic blood flow

25. A 38-year-old woman moves with her family from New York City (sea level) to Leadville Colorado (10,200 feet above sea level). Which of the following will occur as a result of residing at high altitude?

(A) Hypoventilation (B) Arterial Po2 greater than 100 mm Hg (C) Decreased 2,3-diphosphoglycerate (DPG) concentration (D) Shift to the

right of the hemoglobin–O2 dissociation curve (E) Pulmonary vasodilation (F) Hypertrophy of the left ventricle (G) Respiratory acidosis

Answers and explanations:

19. The answer is E [VIII B 2]. Hypoxemia stimulates breathing by a direct effect on the peripheral chemoreceptors in the carotid and aortic bodies. Central (medullary) chemoreceptors are stimulated by CO2 (or H+). The J receptors and lung stretch receptors are not chemoreceptors. The phrenic nerve innervates the diaphragm, and its activity is determined by the output of the brain stem breathing center.

20. The answer is A [IX A]. During exercise, the ventilation rate increases to match the increased O2 consumption and CO2 production. This matching is accomplished without a change in mean arterial Po2 or Pco2. Venous Pco2 increases because extra CO2 is being produced by the exercising muscle. Because this CO2 will be blown off by the hyperventilating lungs, it does not increase the arterial Pco2. Pulmonary blood flow (cardiac output) increases manifold during strenuous exercise.

25. The answer is D. At high altitudes, the Po2 of alveolar air is decreased because barometric pressure is decreased. As a result, arterial Po2 is decreased (<100 mm Hg), and hypoxemia occurs and causes hyperventilation by an effect on peripheral chemoreceptors. Hyperventilation leads to respiratory alkalosis. 2,3-Diphosphoglycerate (DPG) levels increase adaptively; 2,3-DPG binds to hemoglobin and causes the hemoglobin– O2 dissociation curve to shift to the right to improve unloading of O2 in the tissues. The pulmonary vasculature vasoconstricts in response to alveolar hypoxia, resulting in increased pulmonary arterial pressure and hypertrophy of the right ventricle (not the left ventricle).