Respiratory system
Physiology

- Past Papers
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V/Q

* **Normal standing individual, when compared to apical alveolar, the alveoli at the base of the lungs:** important question

a. At RV, their alveoli reach their resting volume.
b. Less compliant.
c. They have a less volume change during inspiration starting from FRC.
d. higher PAO2.
e. At FRC they are less inflated.

Answer: e

Base of Lung	Apex of Lung:
More perfusion and ventilation due to gravity.	Reduced perfusion and ventilation because of lower blood flow and less alveolar inflation.
but the V/Q ratio is lower because perfusion exceeds ventilation indicates: 1.facilitating gas exchange 2.oxygen levels are lower, and CO_2 levels are highe	V/Q ratio is higher because ventilation exceeds perfusion Indicates: 1. gas exchange is less efficient due to less blood flow. 2.higher oxygen levels and lower CO_2 levels
Partial inflated alveoli are more compliant	Fully inflated alveoli less compliant
surrounded by less negative intrapulmonary pressure	surrounded by more negative intrapulmonary pressure

* **Which of the following is true about the apex in comparison with the base of the lung:**

A. Ventilation is higher.
B. The end capillary O2 pressure is higher.
C. V/Q ratio is lower

Answer: B

* **TB Bacilli bacteria (Oxygen-loving Bacteria) would prefer to live and build their nests in the apex of the lung. The reason for that is:**

a. the apical alveoli are more ventilated when compared to basal alveoli.
b. apical alveoli are surrounded with less negative intrapleural pressure.
c. V/Q ratio is more than 1.
d. apical alveoli are more compliant when compared to basal alveoli.
e. apical alveoli are more perfused when compared to basal alveoli.

Answer: C

V/Q ratio is more than 1 Indicates higher oxygen levels

* **Incorrect statement:**

A. at the closing volume the apical alveoli are closed
B. The apical is poorly ventilated.
C. V/Q ratio of base is higher

Answer: A

* **The greatest increase in physiological dead space would be expected with:**

A) Pulmonary embolism
B) Atelectasis (or: collapse of one lung)
C) Pneumothorax
D) Bronchoconstriction
E) Decreased VIQ ratio

ANSWER A

* **In normal person, breathing room air at sea level at rest In standing position. Which of the following statements is true:**

A. Mixed Venus o2 is equal or more than 2oml/dl blood.
B. Compliance is greatest at lung apex.
C. Ventilation at the base is more than ventilation at the apex.

· **Answer: c**

★ **The forces governing the diffusion of a gas through a biological membrane are listed below. Which of the following changes increase the diffusion of a gas through a biological membrane: ↓=decrease, and ↑=increase.**

	ΔP	A	S	d	MW
A.	↓	↓	↓	↓	↓
B.	↓	↓	↓	↑	↑
C.	↓	↓	↑	↓	↓
D.	↑	↑	↑	↓	↓
E.	↑	↑	↑	↑	↑

Answer: d

$$dO2 = \Delta PO2 \; X \; K$$

$$DL = K$$

$$DL = \frac{A}{dx} \; x \; \frac{SO2}{\sqrt{MW}}$$

dO2= oxygen Diffusion
ΔPO2 = partial pressure gradient
K= Permeability
DL = Diffusion capacity of Lung
,A; area
dx; thickness
SO2; solubility of O2
MW; molecular weight

★ **the least important factor in gas diffusion:**

A) molecular weight
B) concentration gradient
C) solubility
D) surface area

ANSWER: A

★ **IF RMV and consumption of CO2 were constant, an increase in which of the following will cause a decrease in arterial CO2:**

A. Anatomical dead space
B. Respiratory rate
C. Tidal volume
D. Breathing frequency

Answer: C

A. Increase ADS causes no washout for CO2 (it is a dead space), so arterial CO2 would increase.
B. Increasing Respiratory rate (= Breathing frequency) would effect the gas exchange (remember RMV is constant)
C. Increasing Tidal Volume could increase amount of air that can be exchanged with.

★ Compared with the systemic circulation, pulmonary circulation has all the following EXCEPT: blood flow……., vascular resistance……., arteriolar compliance…

A) Blood flow: Higher, Vascular resistance: higher, Arteriolar compliance: higher
B) Blood flow: Lower, Vascular resistance: lower, Arteriolar compliance: lower
C) Blood flow: Same, Vascular resistance: lower, Arteriolar compliance: higher
D) Blood flow: Same, Vascular resistance: higher, Arteriolar compliance: lower
E) Blood flow: Same, Vascular resistance: higher, Arteriolar compliance: higher

ANSWER:C

★ In the adult, one of the following is NOT different between the systemic and pulmonary circulation?

A) Volume of blood flowing through it
B) Vascular resistance
C) Capillary hydrostatic pressure
D) Ps (systolic arterial pressure)
E) Pulse pressure

ANSWER A

★ Regarding pulmonary vascular resistance which of the following is true:

A. Low in high lung volume
B. Lower than systemic resistance
C. Is less compliant

Answer: B

✶ compared to resting state, which of the following sets of differences best describes the hemodynamics of the pulmonary circulation during exercise:

	Flow (lit/min)	Resistance	Pulmonary Arterial Pressure
A.	**Higher**	**Lower**	**Higher**
B.	Higher	Lower	Lower
C.	Same	Higher	Lower
D.	Lower	Lower	Lower
E.	Same	Lower	Lower

Answer: A

Changes during exercise:1. Recruitment: Increased number of open capillaries .2. Distention: increased diameter of capillaries decreasing the resistance and blood flow becomes uniform across the lung, making the entire lung zone 3 where there is continuous flow• Arterial pressure > venous pressure > alveolar pressure.

✶ Pulmonary edema due to CHF (congestive heart failure) is due to:

A) Increased pulmonary capillary hydrostatic pressure
B) Increased pulmonary colloidal osmotic pressure
C) Decreased pulmonary interstitial hydrostatic pressure
D) Decreased pulmonary interstitial osmotic pressure
E) Increased pulmonary interstitial hydrostatic pressure

ANSWER: A Refer handout 6

✶ Which of the following sets of differences best describe the hemodynamics of the pulmonary circulation when compared with systemic circulation (in skeletal muscles)?

a. A
b. B
c. C
d. D
e. E

	Blood π c	interstitial π c	Vascular Resistance	Pc
A.	Same	Higher	Higher	Lower
B.	Same	Higher	Lower	Lower
C.	Higher	Same	Same	Higher
D.	Lower	Lower	Lower	Lower
E.	Higher	Higher	Higher	Higher

Answer: B refer Handout 6

★ **Which of these statements is False regarding pulmonary vascular resistance during exercise?**

A) pulmonary arterial pressure increase slightly during exercise
B) pulmonary vascular resistance decreases during exercise.
C) Pulmonary vascular resistance is only one seventh of systemic vascular resistance
D) Increase of lung volume results in increase of resistance in extra alveolar vessels
E) total vascular resistance is increased in emphysema and in pulmonary fibrosis

ANSWER: D

Increase lung volume causes decrease in resistance in extra alveolar vessels.

★ **In normal individual, identify the inconsistent value at sea level**

A. Alveolar PCO_2 = 40 mmHg.
B. pulmonary arterial PO_2 = 100 mmHg.
C. Alveolar PH_2O = 47 mmHg.
D. interstitial PO_2 = 40 mmHg.
E. pulmonary venous PCO_2 = 40 mmHg.

Answer: b

This value is inconsistent because the **pulmonary arterial PO_2** should be around 40 mmHg, as this is the oxygen tension of **deoxygenated blood returning from the systemic circulation.** A value of 100 mmHg is typical for the pulmonary veins after oxygenation occurs in the lungs

* **The following table of normal values (at sea level) contains one error. This error appears in which line.**

PO2	PCO2
100	40
>100	<40
< 90	>40
40	45
>100	< 40

A) pulmonary venous blood
B) alveolar air with high V/Q ratio
C) arterial blood during exercise
D) pulmonary arterial blood
E) mixed expired air

ANSWER: C

In Exercise, arterial blood pressure Po2 nor Pco2 wont change. However, venous Po2 and PCO2 would decrease and increase respectively.

* **In normal person, breathing room air at sea level at rest In standing position. Which of the following statements is true:**

a. Mixed Venus o2 is equal or more than 20 ml/dl blood.
b. Compliance is greatest at lung apex.
c. Ventilation at the base is more than ventilation at the apex.

Answer: c

Mixed Venus o2 is equal ~ 15 ml /dl blood at rest with normal Hb

* **Which of the following statements is false?**

a) In the tissues, PO2 drops as blood passes from the arteries to the veins, while PCO2 increases
b) Blood travels from the lungs to the heart to body tissues, then back to the heart, then the lungs.
c) Blood travels from the lungs to the heart to body tissues, then back to the lungs, then the heart.
d) PO2 is higher in air than in the lungs

ANSWER: C

* **Of the following, which <u>does not</u> explain why the partial pressure of oxygen is lower in the lung than in the external air?**

A) Air in the lung is humidified, therefore, water vapor pressure alters the pressure.

B) Carbon dioxide mixes with oxygen
C) Oxygen is moved into the blood and is headed to the tissues
D) Lungs exert a pressure on the air to reduce the oxygen pressure

ANSWER: D

★ **Which of the following structures contains blood with the highest PCO2?**

A) Carotid bodies.
B) Pulmonary veins
C) Superior vena cava
D)The midportion of pulmonary capillaries.
E) Systemic arterioles

ANSWER:C

★ **What limits the maximum VO2?**

A. Lung capacity
B. Mitochondrial enzymes
C. Cardiovascular system
D. Mitochondria number

Answer: C Refer handout 8

★ **Hypoventilation causes one of the following changes in arterial blood gases:**

A) Increase in arterial PO2, increase in arterial PCO2, and decrease PH
B) Increase in arterial PO2, decrease in arterial PCO2, and increase pH
C) Decrease in arterial PO2, decrease in arterial PCO2, and increase pH
D) Increase arterial PO2, no change in arterial PCO2, and increase pH
E) Decrease in arterial PO2, increase in arterial PCO2, and decrease pH

ANSWER: E

Gas exchange and transport

★ **Which of the following is true regarding gas exchange in alveoli:**

A. Exercise increases the length of capillaries
B. O2 is perfusion limited while CO2 is diffusion limited
C. Exchange continues until the end of the capillary / along the entire length

Answer: A

b. Both gases are perfusion limited and both are not diffusion limited
C. Exchange continues until the 1/3 of capillary length at rest

★ **In normal individual, regarding gas exchange across pulmonary capillaries during mild exercise, which of the following statements is TRUE:**

a. CO2 crosses the membrane easier than 02.
b. Diffusing capacity of the lung for 02 is more than for CO2, the most important factor to play role is the molecular weight of both gases.
c. The length of capillary required for gas equilibrium is shorter during exercise.
d. ABGs become grossly abnormal.
e. Equilibrium across the respiratory membrane is never achieved.

Answer: a

e.equilibrium refers to the point at which the partial pressures of a gas (e.g., oxygen or carbon dioxide) in the alveoli and the pulmonary capillary blood become equal.

★ **Increase ventilation <u>during exercise</u>, which of the following changes occur: "A=stands for alveolar"**

a. increase PAO2, increase PAH2O, increase arterial PCO2.
b. Increase PAO2, unchanged PAH2O, increase arterial PCO2.
c. unchanged PAO2, unchanged PAH2O, unchanged arterial PCO2.
d. decrease PAO2,unchanged PAH2O, decrease arterial PCO2.
e. decrease PAO2, unchanged PAH2O, increase arterial PCO2.

• **Answer: C**

Blood gases (ABG) remain normal, since the production of CO2 is increased, and the alveolar ventilation is increased

★ **Arterial PO2 is reduced in**

A) Pulmonary edema
B) Histotoxic hypoxia
C) Anemia
D) CO poisoning
E) Descending to Dead Sea area

ANSWER: A

* **A 20-year-old male college student participates in a pulmonary study in his physiology lab. He is healthy and in good physical shape. He is asked to run on a treadmill for 20 minutes at a moderate pace, during which time his arterial PCO2 is measured. What is his predicted arterial PCO2 (in mmHg)?**

a. 20
b. 60
c. 80
d. 40

Answer:D

Blood gases (ABG) remain normal, since the production of CO2 is increased, and the alveolar ventilation is increased

* **Which of the following decreases oxygen content but does not alter PaO2 or percentage saturation of hemoglobin:**

a. Ascent to an altitude of 3500 m
b. Polycythemia (high RBC count)
c. Breathing 50% oxygen
d. Anemia
e. Development of a large right-to-left shunt

Answer: D

Development of a **large** right-to-left shunt: Decreases oxygen content and PaO2 and O2 saturation because deoxygenated blood bypasses the lungs and mixes with oxygenated blood.

* **Regarding HbO2 dissociation curve, P50 increases in:**

A. HbF (fetal hemoglobin).
B. during exercise.

C. CO poisoning.
D. when PCO2 decreases.
E. alkalosis.

· **Answer: b**

Factors causes shift to right: 1. Exercise, 2. ↑ CO2, 3. ↑ H+, 4. ↑ DBG 5.↑ temp

★ **Regarding the oxygen extraction ratio, all the following are true EXCEPT:**

A. can be calculated if we know the arterio-venous [O2] difference.
B. increases during exercise.
C. increases when HbO2 dissociation curve is shifted to the right.
D. carotid bodies have the lowest arterio-venous PO2 difference.
E. is fixed under all circumstances.

· **Answer: e**

★ **O2 dissociation curve shifts to Right by all of the following EXCEPT:**

A. Increase [H+].
B. Increase PCO2.
C. Increase temperature.
D. Increase Carbon monoxide.
E. Increase 2, 3, bpG.

Answer: d

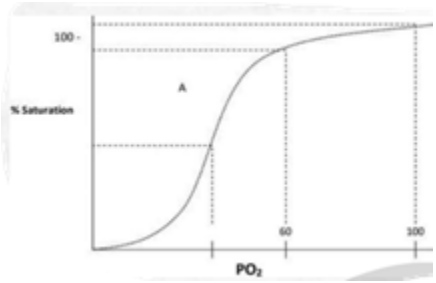
★ **Which of the following would shift HB-O2 to the left?**

A) Exercise
B) HbF
C) Increase alveolar PCO2
D) Whenever P50 increases.
E) Hypoventilation

ANSWER: B

★ **Which of the following is INCORRECT regarding the above oxyhemoglobin curve?**

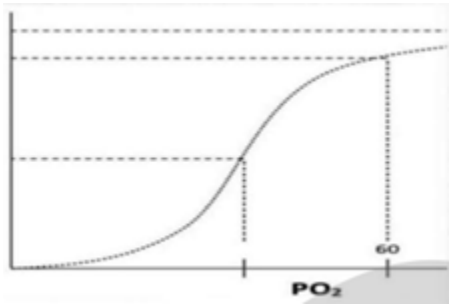
A) higher P50 than normal means that the 02 binds
less tightly to Hb.



B) HbF is normally shifted to the left
C) An increase in PCO2 causes a right shift.
D) An increase in blood pH increases P50.
E) An increase in temperature shifts the 02 uptake curve to the right.

ANSWER:D

★ **The below is normal oxyhemoglobin dissociation curve; an increase in P50 is seen in one of the following conditions:**



A) reverse Bohr's effect
B) decreased local temperature
C) physical exercise
D) increase plasma pH
E) fetal hemoglobin

ANSWER: C

★ **The oxygen dissociation curve of normal adult hemoglobin is most effectively shifted to the right by:**

A) Mixing with fetal hemoglobin
B) Increased 2,3-bisphosphoglycerate (BPG)
C) Cooperative binding of oxygen
D) Increased PH
E) Decreased CO2

ANSWER: B

★ **Which of the following shifts the oxyhemoglobin curve to the left?**

A) Increased temperature
B) Exercise
C) Hyperventilation
D) Metabolic acidosis

ANSWER: C

★ **Which of the following is true regarding a patient with Anemia:**

A. Mixed venous pO2 is reduced.
B. Arterial pO2 is reduced.
C. Arterial - venous [O2] difference decrease

Answer: A refer handout 8

★ **A patient with anemia has which of the following?**

A) A normal arterial blood 02 content
B) Arterial PO2 of 99 mmHG
C) A decreased venous blood PO2
D) Hyperventilation
E) Cyanosis

ANSWER: C pg15 handout 8

★ **In normal person at rest, which of the following decreases arterial PO2:**

a. Polycythemia (high RBC count).
b. CO poisoning.
c. Breathing 50% oxygen.
d. Anemia.
e. Ascent to an altitude of 3500 m.

Answer: e

Polycythemia (high RBC count): Increases the oxygen-carrying While anemia and CO poisoning reduces oxygen-carrying capacity. (A.B.D)don't affect PaO2 ,however, Factors that increase PO_2 would typically involve changes in alveolar oxygen levels or oxygen diffusion into the blood, not changes related to hemoglobin binding, then choice (C) Increases PAO2 while choice (E)leads to hypoxia decreases PAO2

★ **In normal resting individual breathing room air at sea level, voluntary tripling (3x normal) of alveolar ventilation:**

a. raises plasma pH.
b. raises alveolar PCO2 .
c. trebles the partial pressure of oxygen in the alveoli.

d. raises arterial blood oxygen saturation by 3 %.

e. raises arterial blood oxygen content by 3 %.

Answer:A

*The elimination off Co2 will increase → decrease PCO2 →H+ decreased → PH increased ,
*the maximum possible PaO2 that can be achieved while breathing room air at sea level is limited and cannot reach 300 mmHg. The physiological limits and gas laws dictate that the maximum PaO2 remains around 150 =PO2 of inspired air, even with increased ventilation.
*the saturation will not change according to oxygen Hb curve the max saturation is achieved when PO2 =100 further increasing in PO2 will not increase the saturation, since the saturation percentage and the Hb concentration didn't change the [O2] remains the same

*** In the lung, when 02 diffuses from the alveoli to the capillaries, most of it**

A) Remains In solution as 02

B) Converted to oxyhemoglobin

C) Converted to bicarbonate ions in RBC

D) Combines with plasma proteins

E) Combines with H2O in plasma to form carbonic acid

ANSWER: B

*** Which of the following statements about the transport of O2 & CO2 by the blood is true:**

A) Most CO2 is transported in the dissolved form

B) The % saturation of hemoglobin with O2 will increase if the arterial pCO2 is increased

C) A decrease in the % saturation of hemoglobin with O2 increases CO2 transport

D) In anemia both arterial pO2 and 02 content are decreased

E) The reduced arterial pO2 in an individual living at high altitude is due to impairment in 02

ANSWER: C

*** In the chloride shift, chloride ions exchange place with:**

A) Bicarbonate ion

B) Sodium ions

C) Potassium ions

D) hydrogen ions
E) Hemoglobin

ANSWER: A

★ **Which of the following increases the PO2 :**

A. increase pco2.
B. increase temperature.
C. increase 2,3-BPG.
D. co poisoning.
E. fetal Hb.

· **Answer: E (not sure) (2020)**

CO poisoning

★ **In Carbon monoxide (CO) poisoning patient but with normal lungs, all the following are expected to decrease EXCEPT:**

A. Arterial oxygen concentration [02]a.
B. Venous oxygen concentration [02]v.
C. Arterial P02.
D. 02 Sat.
E. 02 availability to the tissue.

· **Answer: C**

★ **Decreased arterial PO2 is a consequence of all the following EXCEPT:**

A) breathing at high altitude.
B) IRDS
C) pulmonary edema

D) COPD
E) CO poisoning

ANSWER: E

★ Regarding carbon monoxide poisoning, one of the following is TRUE:

A) Increases firing rate from the peripheral chemoreceptors to the respiratory center

B) decreases arterial O2 concentration
C) Decreases arterial PO2
D) can be self-limited disease
E) as long as PCO arterial is below 1 mmHg, we should not worry.

ANSWER: B

★ Regarding carbon monoxide poisoning, one of the following is FALSE:

A. If sever enough, can leads to death.
B. causes hypoxia.
C. affect oxygen availability to the tissues.
D. associated with low arterial PO2.
E. hemoglobin-O2 saturation is depressed

· Answer: d

CO poisoning wont affect PO2, as PO2 refelects o2 dissolved in blood. However, CO causes shift-to-left for hemoglobin-O2 saturation. Refer handout 8

calculations

To solve these questions, you just use this equation = Hb concentration X 1.34 X saturation

★ **If blood Hb concentration is 15 g/dL, arterial PaO2 is 100 mm Hg, and hemoglobin is 98% saturated with oxygen, the volume of oxygen contained in 100 ml of blood is approximately:**

- A. ≈6.6 ml.
- B. ≈13.4 ml.
- C. ≈15 ml.
- D. ≈20 ml.
- E. Cannot be calculated from the above data.

- **Answer: d**

15 g/dL X 1.34 X .98 = 19.68

★ **For a normal Hb-02 dissociation curve, the most correct relationship is:**

A) PaO2 40 mmHg, SaO2 40%
B) PaO2 26 mmlig, SaO2 26%
C) PaO2 60 mmHg, Sa02 90%
D) PaO2 120 mmHg, SaO2 120%
E) PaO2 70 mmHg, SaO2 40%

ANSWER:C

PO2	O2 Sat (%)
10	25
20	35
26	50
30	60
40	75
50	85
60	90
80	96
100	98

★ **If blood Hb is 10 g/dL, PaO2 is 100 mm Hg, and hemoglobin is 50% saturated with oxygen, the volume of oxygen contained in 100 ml of blood is approximately:**

A) 5.6 ml
B) 6.7 ml
C) 9.5 mi
D) 19.5 ml
E) Cannot be calculated from the above data

ANSWER: B

* **If 1 g of hemoglobin has an oxygen capacity of 1.34 ml, of oxygen, what is the oxygen content of blood containing 10 g of hemoglobin when the blood PO2=40 mmHg**

A) =6 mL/dL
B) =8 mL/dL
C) =10mLdL
D) =12 ml/dl.
E) Cannot be calculated from the information provided

ANSWER: C

Oxygen content = HB x amount of O2 carried x saturation. The answer: 10 X 1.34 X .75 (remember at po2 =40, sat = 75%) = 10 ml/dL

* **If Hb concentration is 7.5 g/dl, and the arterial blood 02 sat is 98%, what would be the concentration of arterial O2?**

A) Arterial [02] cannot be calculated.
B) The dissolved O2 becomes more than the Hb-bound 02.
C) There is about 15 ml of oxygen per 100 ml of arterial blood.
D) Arterial [02] equals 10 ml/dl.
E) When [Hb] equal 7.5 g/dl, the automatically, 02 Sat never exceeds 50%.

ANSWER:D

Concentration of arterial O2 means how much o2 can be carried by hemoglobin (ignoring dissolved O2).
1. Multiply by 1.34 o2/ ml 2. Multiply by saturation. 7.5 X 1.34 X 98% ≈ 10

* **Which of the following conditions would result in the highest oxygen content per milimeter of blood?**

A) Hemoglobin concentration=5 PaO2=90 mmHg
B) Hemoglobin concentration= 5 PaO2=500 mmHg
C) Hemoglobin concentration=3 PaO2=90 mmHg
D) Hemoglobin concentration=10 PaO2=60 mmHg
E) Hemoglobin concentration=16 PaO2=28 mmHg

ANSWER: D

He wants the highest concentration meaning amount of O2 is carried by hemoglobin.
a. 5 x 1.34 x 100% = 6.7

b. 5 x 1.34 x 100% = 6.7(remember saturation reaches plateau after 100)

D. 10 x 1.34 x 90% = 12

e. 16 x 1.34 x 50% = 10.72

Regulation of respiration

* **hyperventilation can result from:**

a. increase alveolar Pco2
b. Increase alveolar Po2
c. Decrease arterial Pco2 below 30 mmHg
d. Direct stimulation of central chemosensitive receptors due to increase PH
e. decline of arterial Po2 from 100 mmHg to 70 mmHg

Answer: A

decline of arterial Po2 from 100 mmHg to 60 mmHg will stimulate the hyperventilation

* **Which of the following is the primary regulating variable of the peripheral chemoreceptors:**

· A. PaO2.
· B. PaCO2
· C. arterial pH.
· D. Input from stretch receptors.
· E. CSF PO2.

· **Answer: a (Refer handout 11)**

* **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 PCO2 of systemic arterial blood
C) decreases the pH of systemic arterial blood

D) increases brain blood flow
E) make alveolar air full of O2 which divers can use while diving

ANSWER: B

* **The arterio-venous PO2 difference in the lowest in which of the following organs/tissues (at rest) ?**

A) kidneys
B) heart
C) bronchial circulation
D) brain
E) skeletal muscles

ANSWER: A

* **Peripheral chemoreceptors:**

A) Respond only to increased/decreased H+
B) Respond only to low 02.
C) Stimulated by carbon monoxide
D) Having the lowest arterio-venous 02 difference in our body
E) Aortic bodies innervated by glossopharyngeal nerve

ANSWER: D

* **in an individual the ventilation didn't increase when the inspired pCO2 was increased, but decreased during increased inspired pO2. Which of the following is most likely the cause for this response in ventilation:**

A) Dysfunctional central chemoreceptors
B) Hypersensitivity of the peripheral chemoreceptors
C) Bronchial muscle spasm
D) Diaphragmatic fatigue
E) Normal functioning of the central and peripheral chemoreceptors

ANSWER: A

* **Breathing:**

A) Is not dependent on nervous impulses

B) Is a chemical process by definition
C) Depends on the ability of cells to oxidize materials.
D) Is best described as mechanical process
E) Cannot be voluntary controlled

ANSWER: D

★ **A patient has the following arterial blood values: pH=7.52 pCO2=20 mmHg HCO3-=16 mEq/L. He most likely:**

A. Hypo-ventilating
B. Has an acid base disorder caused by over-production of fixed acids
C. Has a respiratory alkalosis
D. Has a complete respiratory compensation
E. Has renal compensation that causes his arterial HCO3- to increase

Answer: C

The patient presents with respiratory alkalosis caused by hyperventilation, as indicated by the very low pCO2. The low HCO3- represents the renal compensation mechanism to mitigate the alkalosis, helping to maintain a near-normal pH
Complete respiratory compensation occurs when the change in ventilation successfully normalizes the pH to within the normal range (approximately 7.35 to 7.45)

★ **Rapid forced breathing:**

a. Is called hyperventilation
b. Induced a state of alkalosis
c. Induces a state of acidosis
d. A and B are correct
e. A and C are correct

Answer: D

★ **All the following is true regarding peripheral chemoreceptors except:**

A. Response to low O2
B. Is triggered by CO2.
C. Sensitive to H+ content

Answer: B

Peripheral responds to O2 and H+, while Central responds to CO2

* **In a normal person breathing 42% oxygen at rest for 10 minutes:**

a. Pulmonary vascular resistance is more at rest compared to exercise.
b. This person's mixed expired PCo2 decreases.
c. The entire lung becomes zone (1)
d. Mixed venous [02] increases significantly.
e. 02 extraction ratio is about 42%.

Answer: b

A. PVR is indeed higher at rest compared to exercise, but this fact is not particularly relevant to the scenario involving breathing 42% oxygen. This makes A a true but unrelated statement to the question.
B. Breathing a **higher oxygen concentration (42% O_2) reduces the stimulus for ventilation** (due to reduced chemoreceptor activation). This can lead to reduced alveolar ventilation, which decreases the amount of being exhaled, lowering mixed expired
C. This is uncommon in a healthy person breathing oxygen at rest and is more likely to occur in hypovolemia or with high positive pressure ventilation.
D,not significant in a normal person because hemoglobin is already nearly fully saturated under normal conditions.
E. The normal extraction ratio (oxygen consumption divided by oxygen delivery) is around 25-30% at rest

* **When the inspiratory muscles are relaxed, the lungs are at:**

a. vital capacity.
b. residual volume.
c. minimal volume.
d. functional residual capacity.
e. inspiratory capacity.

Answer: d

High altitude

* **When will be happen to the partial pressures of O2 and CO2 when ascending to high altitude:**

a.PO2 increases, and PCO2 increases

b.PO2 increases, and PCO2 decreases
c.PO2 decreases, and PCO2 increases
d.PO2 increases, and PCO2 doesn't change
e.PO2 decreases, and PCO2 decreases

Answer:E

* **All of the following parameters are decreased on ascending to high altitude except:**

A. Arterial pO2
B. Alveolar air pCO2
C. Hb % saturation
D. Systemic arterial pH
E. Arterial O2 content

Answer: D

* **Hypoxic hypoxia mainly attributed to:**

A. Respiratory membrane thickness
B. Increased distance between alveolar and capillary distance
C. Decreased partial pressure of O2 in atmosphere
D. Increased red blood cells in pulmonary arterioles
E. Increased PO2 in inspired air

Answer: C

* **At high altitude the following changes take place EXCEPT:**

A) Increase alveolar PCO2
B) Increase ventilation
C) Increase respiratory rate
D) Increase in O2 carrying capacity of blood
E) Decrease alveolar PO2

ANSWER:A

★ **How would the resistance of the pulmonary vasculature of a pt at high altitude differ from that of a pt at sea level? (student)**

$$R = \frac{8\,n\,l}{\pi\,r^4}$$

↑altitude ➔ ↓ Hypoxia ➔ bronchoconstriction ➔ ↑ Resistance

★ **Compared to sea level area, in Dead Sea area?**

A) Respiratory minute ventilation is less
B) Percent of 02 in the outside air is more
C) Percent of 02 in outside air is less
D) Percent of 02 in the outside air remains the same.

ANSWER: D

★ **When you climb the top of Everest, what changes will happen:**

a. respiratory minute ventilation is less.
b. percent of O2 in the outside air is more.
c. percent of O2 in the outside air is less.
d. percent of O2 in the outside air remains the same.

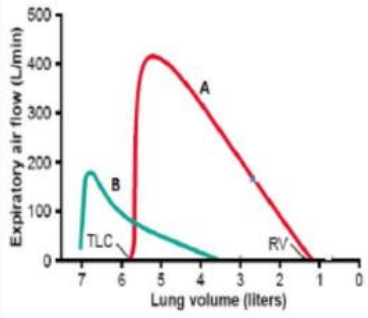
Answer: d

When climbing to high altitudes, such as the top of Everest, the respiratory minute ventilation increases as a physiological response to compensate for the lower oxygen availability. Although the percentage of oxygen in the atmosphere remains constant at about 21%, the atmospheric pressure (PATM) decreases at higher elevations. This reduction in pressure results in a lower partial pressure of oxygen (PO2), making it more challenging for the body to obtain sufficient oxygen for its needs.

Pulmonary function tests- lab

★ **The maximum expiratory flow- volume curves in the diagram above were obtained from a healthy individual (curve A) and a 57 year old man who**

complains of shortness of breath (curve B). Which of the following disorders does the man most likely have:



a. Asbestosis.
b. Emphysema.
c. Fibrosis.
d. Acute asthmatic attack.
e. ARDS.

Answer: B

Curve Coving and increase in TLC indicate obstruction problem

★ **One of the followings is expected in idiopathic pulmonary fibrosis:**

a. lower than normal FRC.
b. higher than normal tidal volume.
c. lower than normal pulmonary vascular resistance.
d. higher than normal TLC.
e. higher than normal lung compliance.

Answer: a

In idiopathic pulmonary fibrosis (IPF), lung capacities and volumes are reduced due to the restrictive nature of the disease, leading to decreased compliance. Increased pulmonary vascular resistance occurs due to hypoxia, as insufficient oxygen diffuses into the capillaries. This hypoxia causes vasoconstriction of the pulmonary capillaries, further raising vascular resistance. Overall, these factors contribute to decreased lung function and potential complications in IPF.

★ **What is common between obstructive and restrictive pulmonary diseases:**

A. low FEV1.0.
B. low FVC.
C. low FEV1.0/FVC.
D. high TLC.
E. low respiratory vascular resistance.

Answer: a

According to lab slides

	FEV1	FVC	FEV1/FVC
Normal	80%-120% of the predicted value	80%-120% of the predicted value	>70%
Obstructive lung disease	Decreased	Normal or **decreased**	**Decreased**
Restrictive lung disease	Decreased	**Decreased**	Normal or increased

* **An individual with normal lung compliance and increased airway resistance would face problem mainly during:**

A. Expiration but only during exercise.
B. Inspiration but at night only.
C. Both inspiration and expiration but more in inspiration.
D. Inspiration.
E. Expiration.

· **Answer: e**

* **A 49 year old coal miner presents with dyspnea and nonproductive cough and decreased exercise tolerance. Lung tests reveal the followings: total lung capacity= 3.34 L (56%of predicted), residual volume = 0.88 L (54% of predicted) and forced vital capacity =1.38 L (30% of predicted). His arterial PO2 is 68 mmHg. Which of the following values will be approximately normal:**

A. FEV1.0/FVC.
B. Tidal volume.
C. V/Q ratio.
D. Diffusing capacity.
E. Lung compliance.

· **Answer: a**

*

* **Regarding lung diseases, one of the following is true**

a. Increase in the diameter of the airways by 10% results in a increase in airway resistance by more than 10%.

b. COPDS are least common seen in clinical Practice.
c. Pulmonary fibrosis is an example of increase airway resistance.
d. In pulmonary fibrosis, FEV1.0/FVC is ≥ normal.
e. In obstructive lung diseases, difficulty is during inhaling rather than during exhaling.

Answer: d

★ · **Regarding bronchial asthma, all the following statements are true EXCEPT:**

a. Cough suppressants are highly indicated.
b. Airway resistance is increased.
c. During the attack, FEV1.0/FVC is 80%.
d. Bronchodilators can be given to asthmatic patients.
e. Patients might be allergic to pollens.

· **Answer: C**

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بعد 466 يوم