بسم الله الرحمن الرحيم

PHYSIOLOGY

MID | Lecture 1-8

Past Papers

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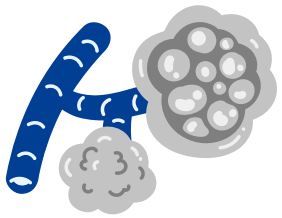
﴿ وَلَقَدْ نَعْلَمُ أَنَّكَ يَضِيقُ صَدْرُكَ بِمَا يَقُولُونَ ﴿٩٧﴾ فَسَبِّحْ بِحَمْدِ رَبِّكَ وَكُن مِّنَ السَّاجِدِينَ ﴾

سبحان الله وبحمده ، سبحان الله العظيم



Q1: The incorrect statement about gas diffusion:

Answer: CO2 is affected first in respiratory diseases.

Q2: the least important factor in gas diffusion:

A) Molecular weight
B) Concentration gradient
C) Solubility
D) Surface area

Ans: A

Q3: When you climb the top of Everest, what changes will happen :

A) Respiratory minute ventilation is less
B) Percent of O_2 in the outside air is more
C) Percent of O_2 in the outside air is less
D) Percent of O_2 in the outside air remains the same

Ans: D

Q4: Which statement is FALSE about anatomical dead space?

A) Anatomical dead space varies with age
B) No gas exchange occur at the level of anatomical dead space
C) Has No physiological importance
D) Its measurement needs medical instrument (Not spirometer)
E) Estimated at around 150 ml in a 75 kg man with Tidal volume 500 ml

Ans: C

Q5: Compared to sea level area, in Dead Sea area?

A) Respiratory minute ventilation is less
B) Percent of O_2 in the outside air is more
C) Percent of O_2 in the outside air is less
D) Percent of O_2 in the outside air remains the same

Ans: D

Q6: Regarding an anatomic Dead Space one of the following is **true**?

A) Cannot be measured in normal human being
B) Its PaO_2 is less than outside PaO_2

Ans: B

Q7: 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.
Abbreviations: (ΔP): difference across the membrane,
(A): the cross sectional area of the membrane,
(S) the solubility of the gas, (d) the distance of diffusion and (MW) the molecular weight of the gas

	ΔP	A	S	d	M	W
A.	↓	↓	↓	↓	↓	
B.	↓	↓	↓	↑	↑	
C.	↓	↓	↑	↓	↓	
D.	↑	↑	↑	↓	↓	
E.	↑	↑	↑	↑	↑	

Ans: D

Q8: In a normal person, what is the PO_2 (in mm Hg) of moist inspired air (humidified atmospheric air) in the anatomic dead space in a person breathing room air at sea level?

A) 100
B) 150
C) 160
D) 760
E) Cannot be predicted from the above data

Ans: B

Q9: Compared to sea level, at the top of Mount Everest :

A) Percent of O_2 in the outside air remains the same
B) Atmospheric pressure is more
C) PaO_2 of outside air is more
D) PaO_2 of outside air remains the same
E) Respiratory minute ventilation is less

Ans: A

Q10: Of the following, which does not explain why the partial pressure of oxygen is lower in the lung than in the external air?

A) Air in the lungs 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 pressure on the air to reduce O_2 pressure

Ans: D
Not sure

Q11: Which of the following is diffusion limited gas exchange?

A. N_2o.
B. CO_2 in normal conditions.
C. O_2 in normal conditions.
D. O_2 in patients with fibrosis.

Ans: D

Q12: Which of the following statements is false?

A) In the tissues, PaO_2 drops as blood passes from arteries to veins, while $PaCO_2$ 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) PaO_2 is higher in air than in the lungs

Ans: C

Q13: why the partial pressure of oxygen is lower in the lung than in the external air?

Ans: air in the lung is humidified

Q14: 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 PCO_2 is measured. What is his predicted arterial PCO_2 (in mm Hg) ?

A) 20
B) 60
C) 80
D) 40

Ans: D

Q15: In a normal person breathing room air at sea level, first part of the expired air, when compared to room dry air, normally contains____PO_2 values, ___PCO_2 values, and _____PH_2O values. (H, higher; L lower; E, equal)

A) L,L,L
B) L,E,H
C) H,L,E
D) E,E,H
E) E,E,E

Ans: B

Q16: Place the following steps for normal inhalation in order.

(1) decrease in intrapleural pressure to 754 mmHg (from -4 mmHg to -6 mmHg).

(2) flow of air from higher to lower pressure (inhalation).

(3) lung size increases.

(4) decrease in intraalveolar pressure to 759 mmHg (-1 mmHg).

(5) Contraction of the diaphragm + external intercostals muscles.

A) 5,2,3,4,1

B) 1,3,4,5,2

C) 5,4,3,2,1

D) 5,1,3,4,2

E) 1,2,3,4,5

Ans: D

Q17: In normal individual, regarding gas exchange across pulmonary capillaries during mild exercise, which of the following statements is TRUE?

A) CO_2 crosses the membrane easier than O_2
B) Diffusion capacity of the lungs for O_2 is more than for CO_2, the most important factor to play a role in the molecular weight of both gases
C) The length of the capillary required for gas equilibrium is shorter during exercise
D) ABGs become grossly abnormal
E) Equilibrium across the respiratory membrane is never achieved

Ans: A

Q18: At the end of inspiration at rest in normal individual at sea level:

A) Intrapleural pressure becomes subatmospheric and intrapulmonary pressure become above atmospheric
B) Intrapleural pressure becomes equal to intrapulmonary pressure
C) Intrapleural pressure remains subatmospheric and intrapulmonary pressure becomes atmospheric
D) Intrapleural pressure becomes above atmospheric and intrapulmonary pressure becomes above atmospheric
E) Intrapleural pressure becomes above atmospheric and intrapulmonary pressure becomes subatmospheric

Ans: C

Q19: Hypoventilation causes one of the following changes in arterial blood gases:

A) Increase in arterial PaO_2, increase in arterial $PaCO_2$, and decrease pH
B) Increase in arterial PaO_2, decrease in arterial $PaCO_2$, and increase pH
C) Decrease in arterial PaO_2, decrease in arterial $PaCO_2$, and increase pH
D) Increase in arterial PaO_2, no change in arterial $PaCO_2$, and increase pH
E) Decrease in arterial PaO_2, increase in arterial $PaCO_2$, and decrease pH

Ans: E

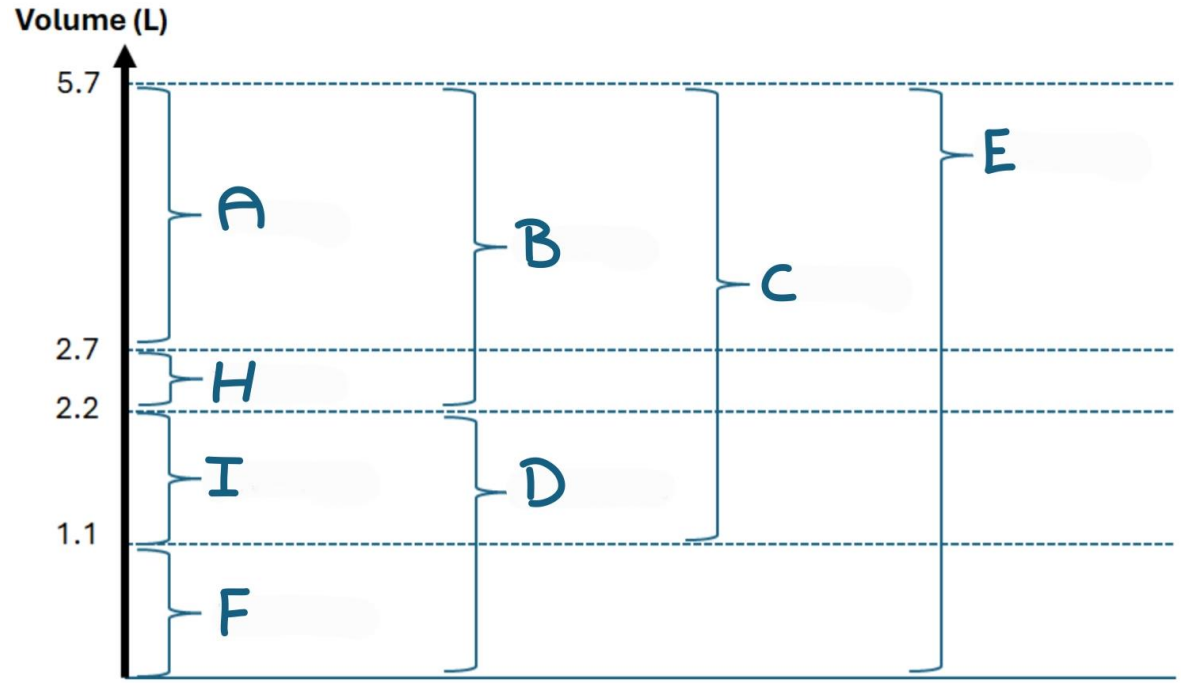
Q20: Which of the following has the highest PCO_2:

A) Interstitium
B) Mixed expiratory air
C) Pulmonary artery
D) Pulmonary vein
E) Intracellular compartment

Ans: E

Q21: Which one represents the highest compliance:

A) C
B) D
C) B
D) E



Ans: D

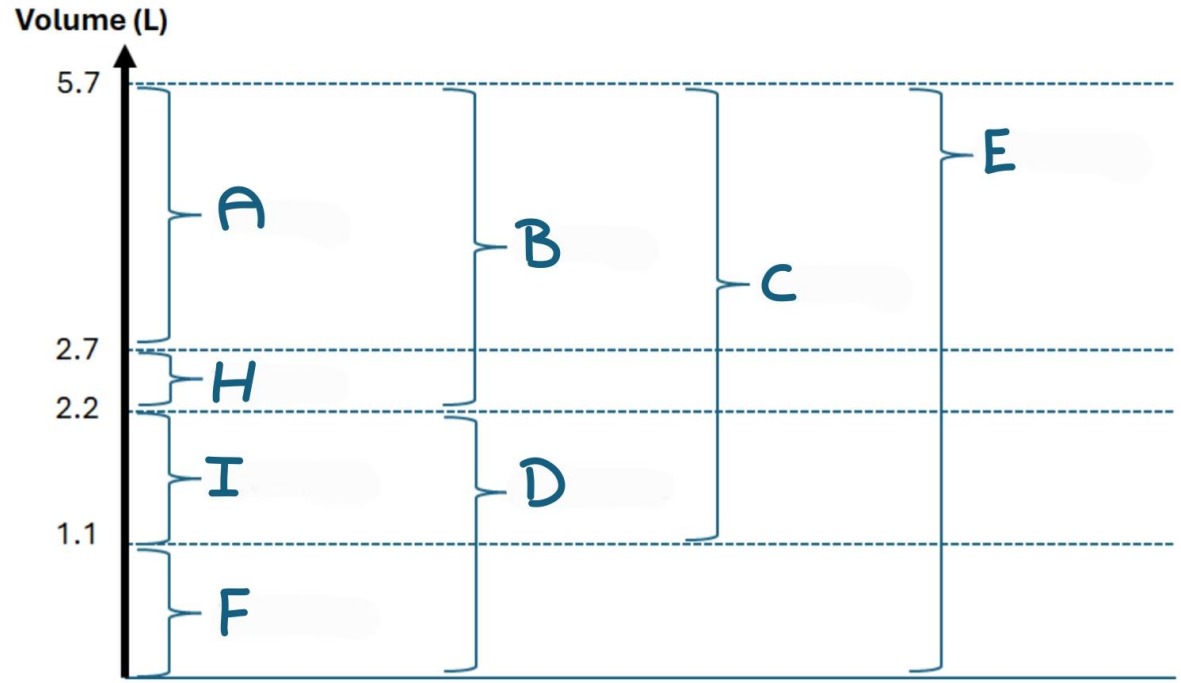
Q22: Regarding physiological dead space (VD) choose the False statement:

A) If V/Q ratio is increased, VD will decrease
B) VD is equal or more than anatomical dead space.
C) In normal individual VD = ADS
D) Is defined as the volume of gas which doesn't take part in gas exchange.
E) To measure VD, you need to measure mixed expiratory $PeCO_2$.

Ans: A

Q23: Which one represents vital capacity and residual volume:

A) C & F
B) A & C
C) B & C
D) D & F



Ans: A

Q24: Tidal volume=500, $PaCO_2$=50, PmixE=40, find **PDSV**:

Answer: 100

Q25: Tidal volume=500, $PaCO_2$=50, PmixE=40, find minute alveolar ventilation (MAV):

SUPPOSE respiratory rate = 15 breaths/min

Alveolar gas volume = Tidal volume – PDSV
= 500 – 100
= 400 ml = 0.4 L

Minute alveolar ventilation = Alveolar gas volume (per breath) × Respiratory rate
= 0.4 × 15 = **6 L/min**

Q26: What does a decrease in V/Q ratio lead to:

Answer: Increase pulmonary resistance

Q27: Which of the following decreases in obstructive but not in restrictive disease:

Answer: FEV1/FVC

Q28: A patient present with a physiological dead space of 120 ml, a tidal volume of 480 ml, which of the following is correct?

A. 25% of tidal volume exchange gases with functional alveoli.
B. 75% of tidal volume exchange gases with functional alveoli.

Ans:B

Q29: What decreases in emphysema:

Answer: FEV1

Q30: This equation can be used to calculate: $\frac{VT\ X\ (P_ACO2 - P_{\hat{E}}CO2)}{P_ACO2} =$

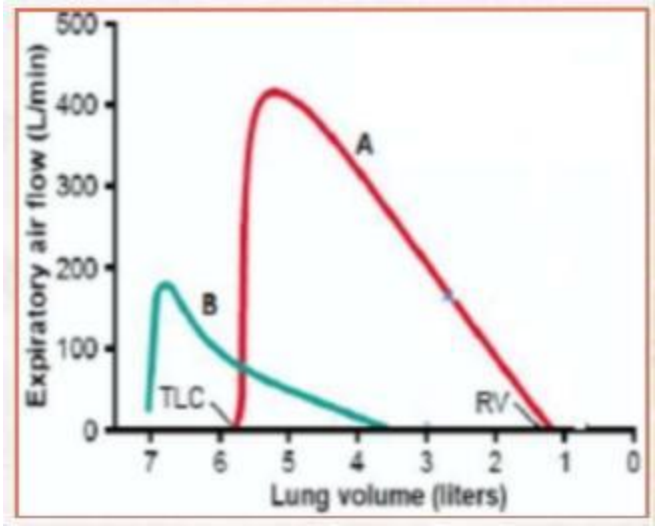
Answer: PDSV

Q31: What is incorrect about residual volume:

Answer: It represents the resting state of the pulmonary-thorax system.

Q32: The maximum expiratory flow-volume curves in the diagram 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?

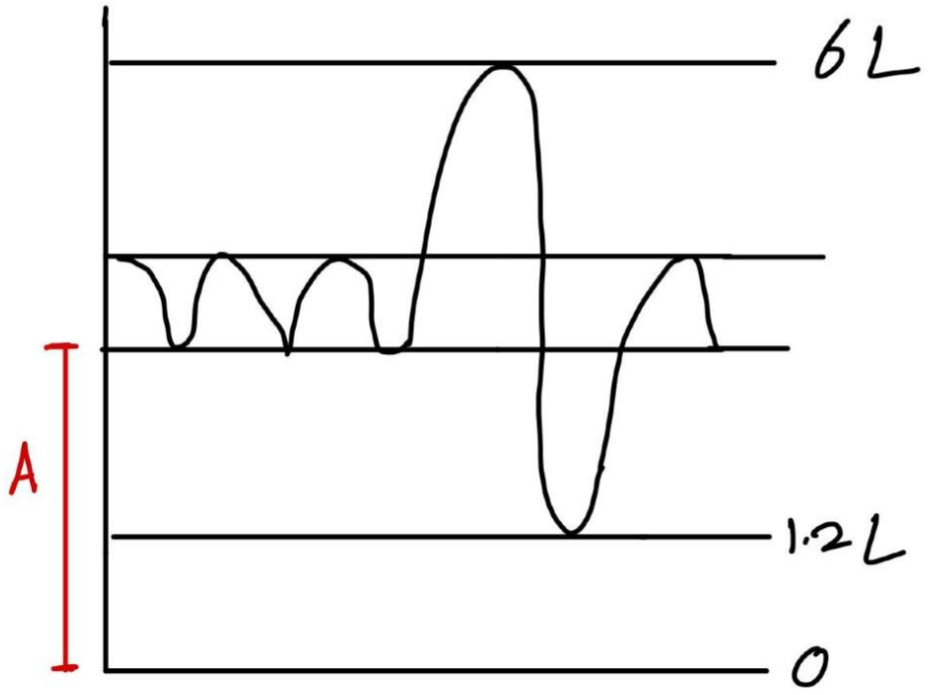
A) Asbestosis
B) Emphysema
C) Fibrosis
D) Acute asthmatic attack
E) ARDS



Ans: B

Q33: Regarding the picture, what is the maximal volume that can be expired after forceful inspiration?

A. 3.8 liter
B. 6.0 liter
C. 4.8 liter



Ans: C

Q34: Which of the following concerning average lung volumes and capacities of a person at rest is TRUE ?
(TLC=total lung capacity; VC=vital capacity;
FRC=functional residual capacity; VT=Tidal volume)

A) TLC>VC>Vt>FRC
B) TLC>FRC>VC>Vt
C) TLC>VC>FRC>Vt
D) TLC>FRC>Vt>VC
E) VC=TLC>FRC>Vt

Ans: C

Q35: The inspiratory reserve volume measures the _____:

A) Amount of air remaining in the lung after a maximal exhalation
B) Amount of air that the lung holds
C) Amount of air that can be further exhaled after a normal breath
D) Amount of air that can be further inhaled after a normal breath

Ans: D

Q36: The total lung capacity is calculated using which of the following formulas?

A) RV+Vt+IRV
B) RV+ERV+IRV
C) ERV+Vt+IRV
D) RV+ERV+Vt+IRV

Ans: D

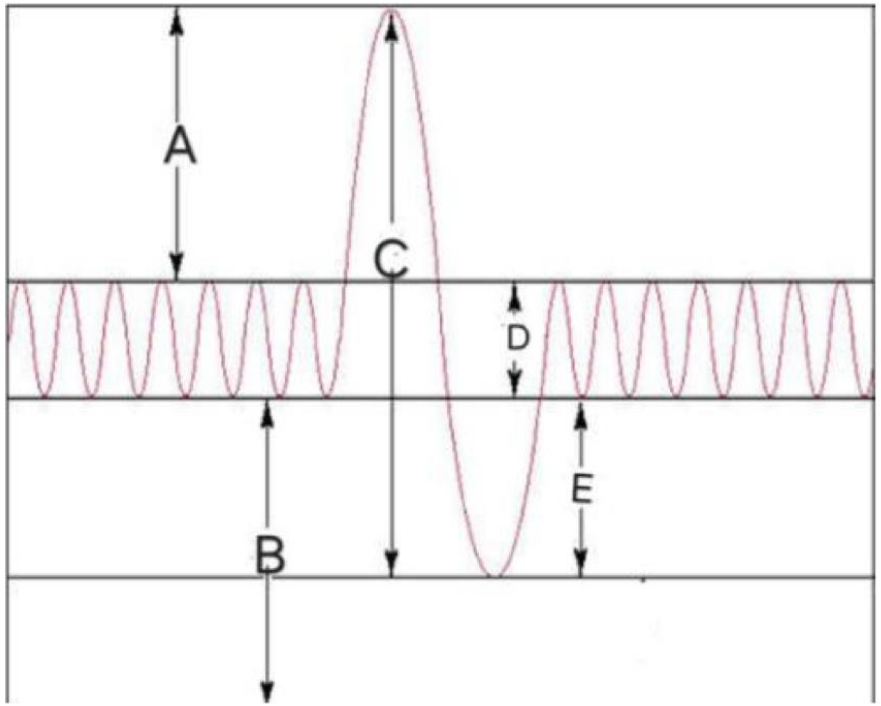
Q37: In a patient the respiratory rate is 20/min and the tidal volume is 500ml (ADSV=150ml) calculate alveolar ventilation

A) 10000ml/min
B) 7000ml/min
C) 3000ml/min
D) 4200ml/min
E) 5000ml/min

Ans: B

Q38: When respiratory muscles of breathing are relaxed, lungs will be at which of the following:

A) A
B) B
C) C
D) D
E) E



Ans: B

Q39: Which of the following is true regarding pulmonary function:

A) FRC is measured using helium dilution method
B) Spirometer is used to measure ADS
C) Minimal volume is a routine clinical test
D) TLC is the volume of air expired from full inspiration to full expiration.
E) Residual volume is the resting volume of the lung.

Ans: A

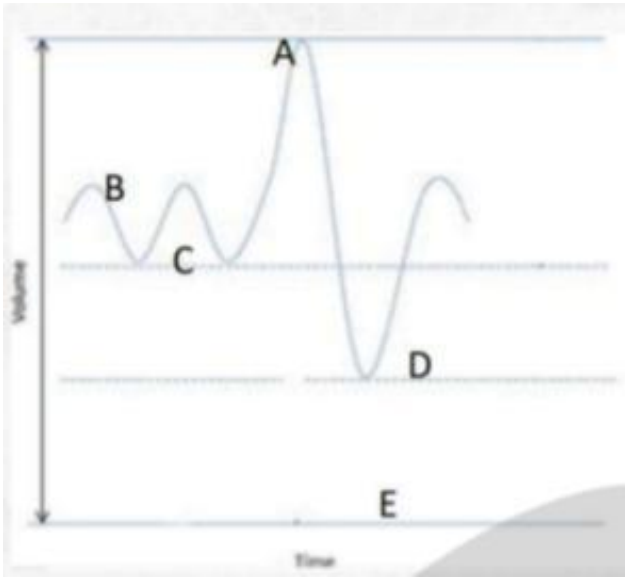
Q40: Spirometry can be used to measure one of the following:

A) RV
B) FRC
C) TLC
D) VC
E) Physiologic dead space volume

Ans: D

Q41: In the following figure which point represent the highest compliance?

A) A
B) B
C) C
D) D
E) E



Ans: C

Q42: The work of breathing is:

A) More in pulmonary fibrosis
B) Directly proportional to lung compliance
C) Is less in emphysema
D) Remain constant during exercise
E) Not affected by airway resistance

Ans: A

Q43: The work of breathing is:

A) Directly proportional to lung compliance
B) Remain constant during exercise
C) Is directly proportional to airway resistance
D) Is less in pulmonary fibrosis
E) Is less in IRDS

Ans: C

Q44: ALL of the following are correct about infant respiratory destress, except:

A) Result in expansion of the alveoli and rupture as compensatory mechanisms
B) lung compliance is low
C) Limited surfactants production
D) high surface tension
E) PEEP and CPAP are used as managements

PEEP (Positive End-Expiratory Pressure)
CPAP (Continuous Positive Airway Pressure)

Ans: A

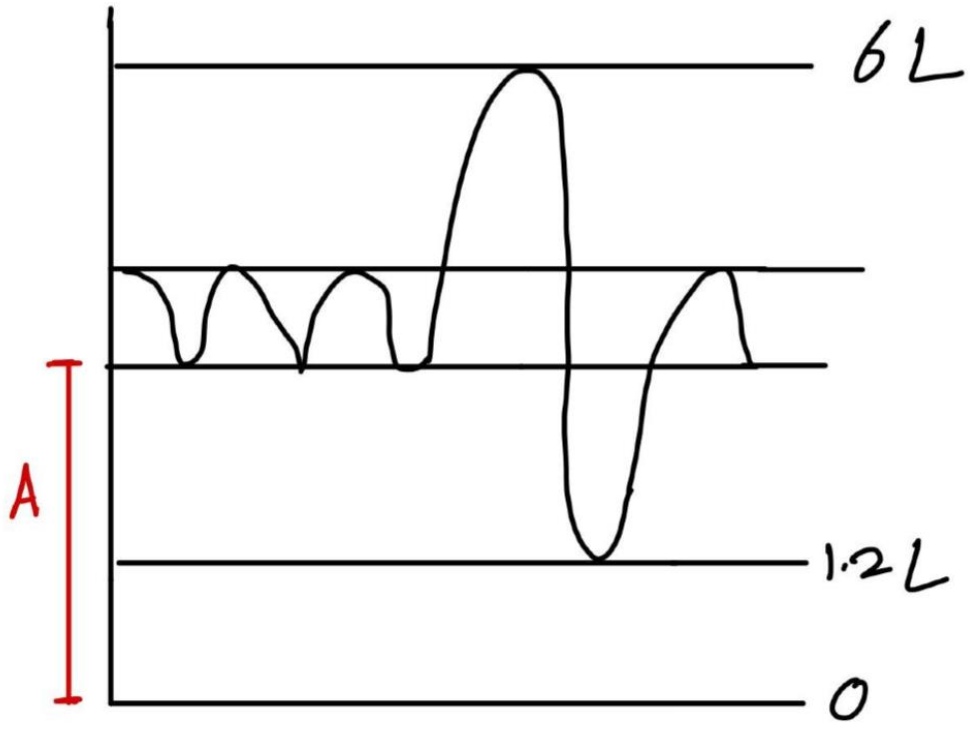
Q45: Regarding surfactant all of the following statements are true except?

A) It is made by alveolar type 2 cells
B) It reduces the work of breathing
C) Its deficiency can cause pulmonary edema
D) Increase surface tension forces

Ans: D

Q46: In the picture , what is correct about the area "A"?

A. It is reduced with fibrosis
B. It is reduced by emphysema
C. Can be calculated by standard spirometer



Ans: A

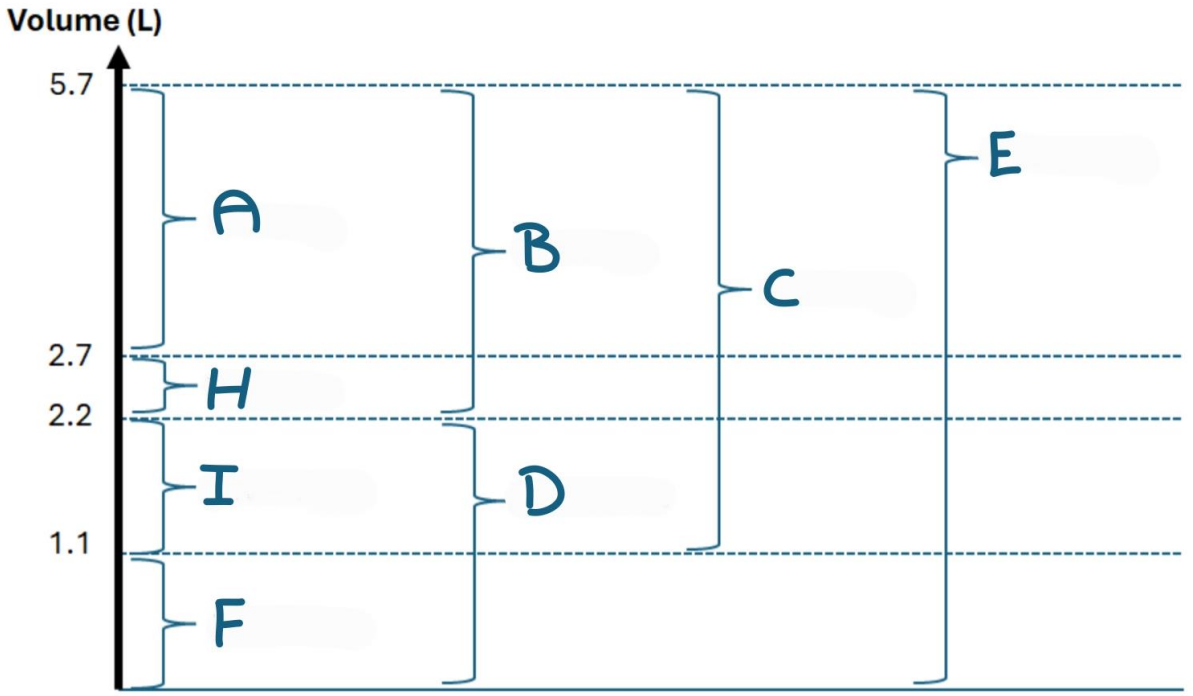
Q47: One of the following changes doesn't occur at high altitudes:

Answer: decrease in O2 concentration.

Remember, the doctor emphasized that gas concentration percentages remain constant; what really changes with different conditions and altitudes is the partial pressure.

Q48: Which one represents the resting volume of the pulmonary-thorax system:

A) A
B) B
C) C
D) D



Ans: D

Q49: TV=350, PDSV=100, RR=15, find PCO_2 after increasing TV by 75mL:

HINT: In order to solve the question, you should know 2 pieces of information:

- Normal alveolar PCO_2 = 40mmHg
- Ventilation is inversely proportional to $PaCO_2$

Ans: 30mmHg

Q50: In the lung, when O_2 diffuses from the alveoli to the capillaries, most of it:

A) Remains in the solution as O_2
B) Converted to oxyhemoglobin
C) Converted to Bicarbonate ions in RBCs
D) Combines with plasma proteins
E) Combines with H_2O in plasma to form carbonic acid

Ans: B

Q51: Which of the following structures contains blood with the highest PCO_2?

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

Ans: C

Q52: A patient comes to the clinic with a left stab in his chest after a fight, complaining from decrease inspiratory force due to pain, respiratory rate is 27 breaths/m, blood pressure 135 BPM and arterial Po_2 is 81 mmHG, on examination, hearing breath sounds on the left side in the distal airways, which of the following is the cause of his respiratory insufficiency during inspiration?

A. Paralysis of the diaphragm
B. Pain after inspiration
C. Equilibrium between the pleural pressure and atmospheric pressure
D. The pleural pressure is more negative

Ans: C

Q53: Which of the following statements is incorrect about surfactant:

A) Amphipathic nature
B) Cause alveolar stability
C) Prevent pulmonary edema
D) Large alveoli has lesser surface tension compared to smaller alveoli
E) Glucocorticoid administration in pregnant woman enhances its production.

Ans: D

Q54: Increase ventilation during exercise, which of the following changes occur? “A=stands for alveolar, a=stands for arterial”:

A) Increase PAO_2, increase PAH_2O, increase $PaCO_2$
B) Increase PAO_2, unchanged PAH_2O, increase $PaCO_2$
C) Unchanged PAO_2, unchanged PAH_2O, unchanged $PaCO_2$
D) Decrease PAO_2, unchanged PAH_2O, decrease $PaCO_2$
E) Decrease PAO_2, unchanged PAH_2O, increase $PaCO_2$

Ans: C

Q55: The region which has the highest PO_2 of the following is?

A) Aorta
B) Pulmonary vein
C) Pulmonary artery
D) Mixed expired air
E) Systemic venous blood

Ans: D

Q56: Which of the following is not correct about FRC?

A) It is about 75% of TLC
B) The elastic recoil of the chest wall is outward
C) The elastic recoil of the lung is inward
D) The lung thorax system is at rest
E) Pulmonary vascular resistance is the lowest

Ans: A

Q57: How do we calculate alveolar minute ventilation?

A) Subtract the alveolar and anatomical dead space volume from Vt
B) Multiply the Vt with the respiratory rate
C) Subtract anatomical dead space volume from Vt and then multiply with respiratory rate
D) Subtract the anatomical dead space volume from Vt

Ans: C

Q58: Maximum volume in the lung after forced inspiration is called?

A) RV
B) TLC
C) FRC
D) IRV
E) ERV

Ans: B

Q59: Which of the following isn't normal finding with aging?

A) Increase in RV
B) Increase in FRC
C) Increase in ERV
D) Increase in closing volume

Ans: C

Q60: Which of the following is NOT true concerning respiratory distress syndrome in premature infants? :

A) Their ability to synthesize surfactant is limited
B) Higher pressures are required to ventilate the lungs
C) Lung compliance is low
D) Positive pressure respirators are often used to assist them in breatging
E) Alveoli tend to over expand and sometimes burst at the end of inspiration

Ans: E

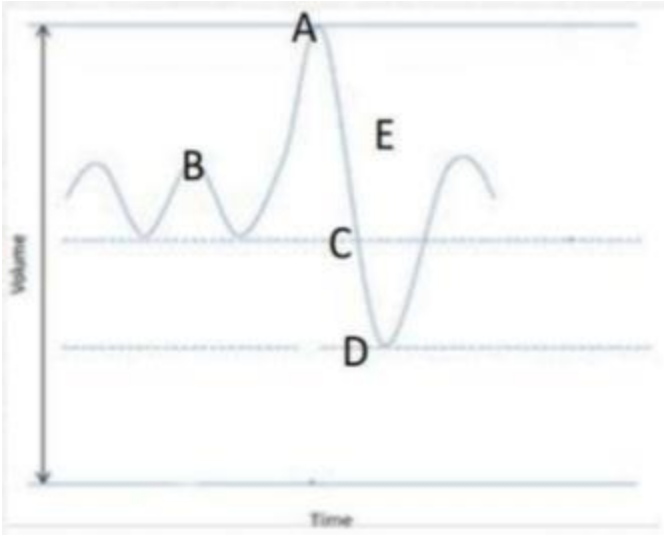
Q61: which of the following decrease during emphysema?

A) Available area for diffusion
B) TLC
C) Closing volume
D) Pulmonary resistance

Ans: A

Q62: In the following figure which point represent the area with the highest resistance?

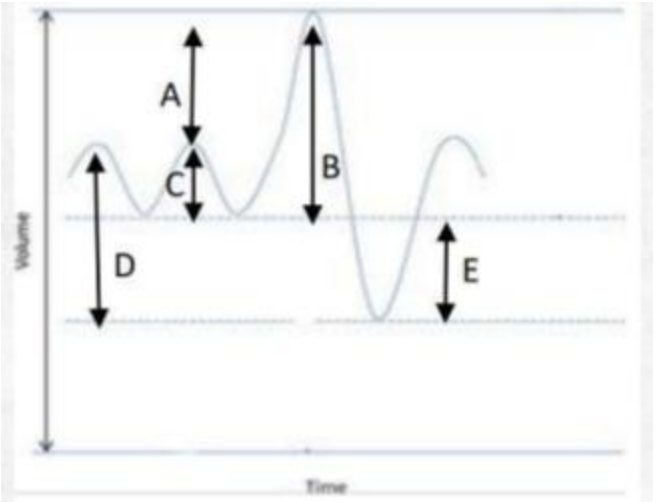
A) A
B) B
C) C
D) D
E) E



Ans: D

Q63: In the following figure which point represent the Inspiratory reserve volume and which represent the expiratory reserve volume?

A) IRV-A // ERV-E
B) IRV-B // ERV-D
C) IRV-A // ERV-D
D) IRV-E // ERV-A
E) IRV-E // ERV-D



Ans: A

Q64: In the presence of surfactant, all the following are expected to **decrease** EXCEPT :

A) Lung tendency to collapse
B) Lung compliance
C) Surface tension forces in the alveoli
D) Lymph flow in the lung
E) Work of breathing

Ans: B

Q65: Compared to lung apex, the base is:

Answer: More ventilated, more perfused, lower V/Q ratio, more compliant

Q66: Compared to systemic circulation, pulmonary circulation has:

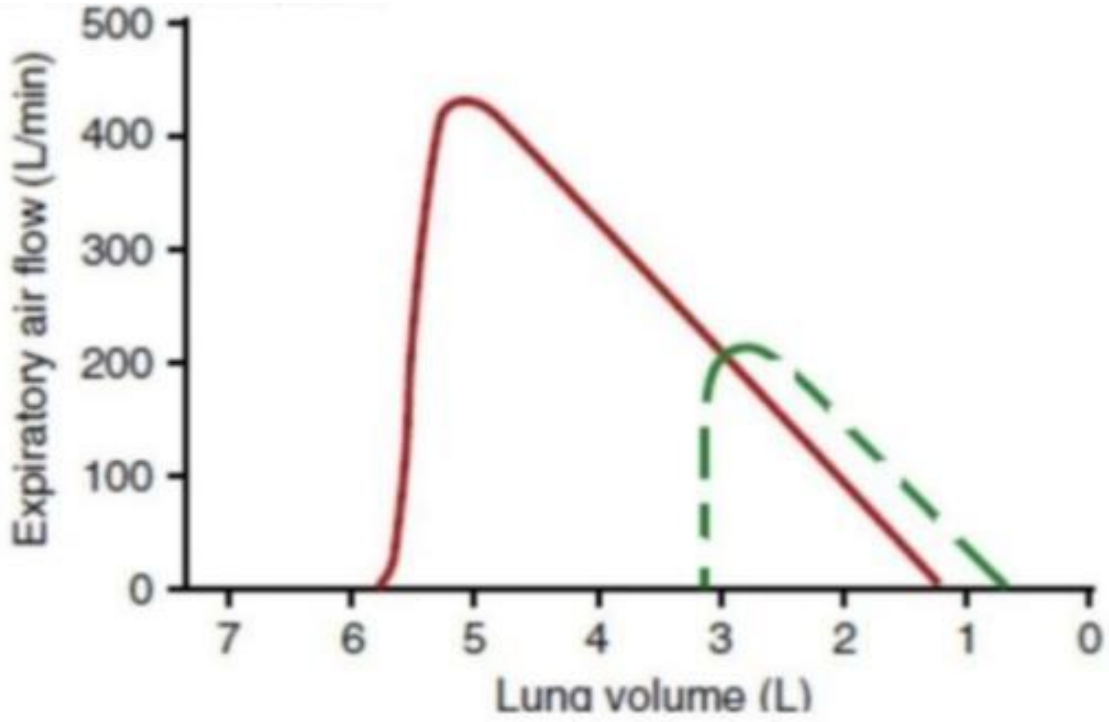
Answer: same blood flow, lower resistance, lower pressure, same osmotic colloid pressure

Q67: What keeps pulmonary blood pressure normal during exercise even though blood flow is increased:

Answer: recruitment of previously closed capillaries

Q68: A 62 years old man reports difficulty breathing. The figure below shows a MEFV (maximum expiratory flow-volume) curves from the patient (green dotted curve) and from a typical healthy individual (red solid curve). Which of the following best explains the MEFV curve of the patient?:

A) Fibrosis
B) Asthma
C) Bronchospasm
D) emphysema
E) Old age



Ans: A

Q69: pneumothorax causes:

Answer: inward deflation of the lung, outward bounce of the thorax

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Q70: 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 O_2 pressure is higher

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Ans: B

Q71: Regarding pulmonary vascular resistance which of the following is true:

A) Low in high lung volumes
B) Lower than systemic resistance

Ans: B

Q72: An infant is born at 32 months age and had acute respiratory distress syndrome and went to the ICU, which of the following is the cause of this condition:

A. Loss of surfactant due to undeveloped type 1 pneumocyte
B. Less work of the longs
C. Increased surface tension
D. Normal po2

Ans: C

Q73: Which of the following about lung ventilation is correct?

A. At functional residual capacity the collapsing forces affecting the lung are higher than the expanding forces.
B. At functional residual capacity, the expanding forces are higher than the collapsing forces.
C. The lung alone has higher compliance than the lung and chest combined.

Ans: C

Q74: In standing normal individual at rest, compared to skeletal muscle capillaries, pulmonary capillaries have:

A) Continuous blood flow in the entire capillary bed (base and apex)
B) more capillary blood oncotic pressure
C) Less capillary blood oncotic pressure
D) Less capillary hydrostatic pressure
E) more blood volume

Ans: D

Q75: A patient with restrictive lung disease will have a relatively normal:

A) FEV_1
B) FVC
C) FEV_1/FVC
D) V/Q ratio
E) pulmonary vascular resistance

Ans: C

Q76: Which of the following sets of differences best describe the hemodynamics of the pulmonary circulation when compared with systemic circulation?

	Flow	Resistance	Arterial P
a.	Same	Lower	Lower
b.	Same	Higher	Lower
c.	Higher	Same	Higher
d.	Lower	Lower	Lower
e.	Higher	Higher	Higher

Ans: A

Q77: Regarding pulmonary vascular resistance:

A) is low at high lung volumes
B) Is low at low lung volumes
C) If increased, can cause right heart failure
D) Is measured through routine pulmonary function tests
E) is more than systemic vascular resistance

Ans: C

Q78: Compared with the systemic circulation, pulmonary circulation has all the following : 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

Ans: C

Q79: 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

Ans: B

Q80: 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

Ans: A

Q81: Comparing the top of the erect lung to the bottom: all are true EXCEPT:

A) Water vapor pressure remains constant.
B) Compliance is more at base than at the apex.
C) Alveolar PCO_2 at apex is lower than at the base
D) Venous return derived from apical regions contain higher PO_2 than from basal regions
E) More V/Q ratio at the base than at the apex

Ans: E

Q82: In bronchial asthma all the following are decreased EXCEPT:

A) Airway resistance
B) FEV_1
C) FEV_1/FVC
D) Diameter of airways
E) Peak expiratory flow rate

Ans: A

Q83: The work of breathing is:

A) Inversely proportional to lung compliance
B) Remain constant during exercise
C) Not affected by airway resistance
D) Is less in pulmonary fibrosis
E) Is less in emphysema

Ans: A

Q84: The work of breathing is:

A) More in pulmonary fibrosis.
B) Directly proportional to lung compliance
C) Is less in emphysema.
D) Remain constant during exercise.
E) Not affected by airway resistance

Ans: A

Q85: The work of breathing is:

A) directly proportional to lung compliance.
B) Remain constant during exercise.
C) is directly proportional to the airway resistance.
D) Is less in pulmonary fibrosis.
E) Is less in IRDS.

Ans: C

Q86: Alveolar oxygen tension (PAO_2) is influenced by all the following EXCEPT:

A) Atmospheric pressure
B) Fraction of oxygen in inspired air (FiO_2)
C) Hemoglobin concentration in the blood
D) Oxygen consumption
E) V/Q ratio

Ans: C

Q87: The following table of normal values (at sea level) contains one error. This error appears in which line.

	PO2	PCO2
A) pulmonary venous blood	100	40
B) alveolar air with high V/Q ratio	>100	<40
C) arterial blood during exercise	< 90	>40
D) pulmonary arterial blood	40	45
E) mixed expired air	>100	< 40

Ans: C

رسالة من الفريق العلمي

اللهم إن عمر عطية في ذمتك وحبل جوارك، فقِه من فتنة القبر وعذاب النار،
أنت أهل الوفاء والحق، فاغفر له وارحمه إنك أنت الغفور الرحيم.

قد وزّعَ اللهُ بينَ الخَلقِ رزقَهُمُ
لَــمْ يخلُقِ اللهُ من خَلقٍ يُضيّعُهُ

لكنّهم كُلِّفُوا حِرصًا فلَسْتَ ترى
مُسترزِقًا وسِوا الغاياتِ تقنِعُهُ

والحِرصُ في الرزقِ والأرزاقُ قد قُسِمت
بغيٌ ألا إنّ بغيَ المرءِ يصرَعُهُ

ومن غدا لابِسًا ثوبَ النّعيمِ بِلا
شُكرٍ عليهِ فإنّ اللهَ ينزَعُهُ

من فراقيّة ابن زريق

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Corrections from previous versions:

Versions	Slide # and Place of Error	Before Correction	After Correction
V0 → V1			
V1 → V2			