

QUIZ HUBIO 541 - THE RESPIRATORY SYSTEM

Nov. 15, 2006

Use a number 2 pencil to mark your answer sheet.

Under ID NUMBER print your **UW student number** and under SPECIAL CODES print your **School of Medicine ID number**. Mark the corresponding grids.

Print your **name (LAST NAME FIRST)** in the spaces provided and mark the corresponding grid under each space.

Please use the **far right hand column of the name grid** to indicate your **GROUP**.

Grp 1 = A; 2 = B, 3 = C; 4 = D; 5 = E; 6 = F; 7 = G; 8 = H.

Mark the group you are attending. If not attending a group, mark **X**

Be certain that **ALL** information is correctly and completely gridded.

When marking an answer, be sure that you are marking beside the proper question number. Mark only one choice for each of the first 38 items. Erase completely if you change an answer. After completing the examination, check for and correct light or stray marks, poor erasures and multiple answers.

Questions 1-12 will count 2 points each; questions 13-38 will count 1 point each, for a total exam score of 50 points.

1. I have read the instructions above and
 - A. I didn't think they applied to me.
 - B. I'm one of the 10% that never get the word.
 - C. I figured my UW number was all you really needed.
 - D. I can't be bribed by a mere 2 points.
 - E. I have correctly entered name, UW number, SOM ID, and **Group** number.
(this answer will self-destruct if not proven true!)

2. Lung compliance is
 - A. independent of lung volume.
 - B. less than the total respiratory system compliance at all lung volumes.
 - C. defined as the distending pressure required to increase volume by 1 liter.
 - D. lower when surface tension in alveoli is high.
 - E. lower when a lung is inflated by internal positive pressure rather than by external negative pressure

3. During a maximal effort to total lung capacity (TLC), all of the following muscles are contracting, **except** the:
 - A. diaphragm
 - B. abdominals
 - C. external intercostals
 - D. sternocleidomastoids
 - E. scalenes

4. Which of the following best represents the pressures likely during inspiratory flow of a normal tidal breath?

	alveolar pressure	pleural pressure	lung recoil pressure
A.	0	-5	5
B.	3	-5	8
C.	0	-10	10
D.	-2	-10	8
E.	-10	-30	20

5. During the passage of blood through the lungs, all of the following normally occur, **except**:

- A. An increase in oxygen partial pressure.
- B. An increase in oxygen saturation.
- C. An increase in plasma bicarbonate.
- D. A shift of the oxyhemoglobin dissociation curve to the left
- E. A fall in carbon dioxide partial pressure.

6. In a patient with an arterial PO_2 of 56 mm Hg and a $Paco_2$ of 32 mm Hg, which of the following could not be contributing to the hypoxemia.

- A. a low fraction of inspired oxygen
- B. hypoventilation
- C. ventilation-perfusion mismatch
- D. right to left shunt
- E. severe diffusion block

7. A Seattle patient ventilated with an inspired oxygen fraction of 0.30 is found to have a PaO_2 of 75 and a $Paco_2$ of 64. His calculated P_{AO_2} is closest to:

- A. 60
- B. 135
- C. 150
- D. 170
- E. 215

8. A 70 yr old male with long smoking history complains of shortness of breath and is found to have the following ABG:

PaO_2 56 $Paco_2$ 50 pH 7.30 HCO_3^- 25.

His acid-base status is best characterized as:

- A. acute respiratory alkalosis
- B. acute respiratory acidosis
- C. chronic respiratory acidosis
- D. metabolic acidosis
- E. metabolic alkalosis

9. When a normal subject acutely hyperventilates
- H^+ and HCO_3^- ions are formed.
 - the HCO_3^- will rise by 1 mEq/liter for each 0.1 unit rise in pH.
 - the number of H^+ ions associated with hemoglobin will decrease.
 - A respiratory acidosis will develop.
 - The output of the central chemoreceptors will increase.
10. Which of the following values cannot be calculated from spirometry?
- Vital Capacity VC
 - Expiratory Reserve Volume ERV
 - Forced Expiratory Volume in 1 sec FEV1
 - Functional Residual Capacity FRC
 - Tidal Volume TV
11. On morning rounds you note three patients with unusual respiratory patterns:
 Mr. Washington, with diabetes, has a respiratory rate of 8 with a $Paco_2$ of 22.
 Mr. Barbarino has a respiratory rate of 20 with a $Paco_2$ of 40.
 Mr. Epstein has a respiratory rate of 20 with a $Paco_2$ of 28.
 Your attending, Dr. Kotter, asks which of these patients is hyperventilating? Your hand shoots into the air and with an "OooohOooohOhhh" you answer:
- Mr. Epstein
 - Mr. Washington
 - Mr. Barbarino and Mr. Epstein
 - Mr. Washington and Mr. Epstein
 - Mr. Washington, Mr. Barbarino, and Mr. Epstein
12. In the normal pulmonary circulation
- total pulmonary vascular resistance is lowest at residual volume.
 - resistance in the alveolar vessels increases at high lung volume.
 - resistance in the extra-alveolar vessels is lowest near residual volume.
 - total pulmonary vascular resistance increases with increased blood flow.
 - total pulmonary vascular resistance is similar to total systemic resistance.

Questions 13-38 consist of a statement followed by numbered options, **any or all** of which may be correct. For each numbered option: answer **A** if the statement is **True** or answer **B** if the statement is **False**.

At Functional Residual Capacity (FRC):

- the lung and chest wall have equal but opposite recoil forces.
- the pleural pressure is negative with respect to atmosphere.
- the total work of breathing is at a minimum.

Forced expiratory flow is driven in part by

16. diaphragmatic contraction
17. abdominal muscle contraction
18. lung recoil force

Anatomic Dead Space

19. would contribute CO₂ free gas to a collection of exhaled gas
20. redistributes CO₂ containing air back into alveoli on inspiration
21. is a component of Alveolar Ventilation

When ventilation-perfusion mismatching is present:

22. The PO₂ will be lower in a low V/Q unit than in a high V/Q unit
23. The blood leaving a low V/Q unit will have a PO₂ 10-20 mmHg lower than that in the alveoli of that unit.
24. The V/Q ratio of a dead space unit is zero.

Blood flow to a particular unit of alveoli will tend to be lower if:

25. the unit is higher in the lung (vs. lower)
26. the alveolar PO₂ is higher (vs. lower)
27. the vascular pressure is higher than alveolar pressure (vs lower).
28. the alveoli are overdistended (vs normal size).

Shortly after initiation of mechanical ventilation with 100% oxygen a patient has PaO₂ 380 PaCO₂ 33 mmHg, pH of 7.60 and HCO₃⁻ of 28. (R= 0.8)

29. An abnormal right-left shunt must be present..
30. The BE is +2
31. A metabolic alkalosis is present
32. A respiratory alkalosis is present

A patient receiving mechanical ventilation is noted to require twice the usual total ventilation per minute to maintain a PaCO₂ of 40 mmHg. This may be due to:

33. a markedly increased metabolic level of oxygen consumption
34. a low cardiac output impairing delivery of CO₂ to the lungs.
35. a markedly increased VD/VT ratio

Which of the following are true of radiographic imaging

36. the tubular structures radiating out from the hila in a normal chest radiograph are pulmonary arteries and veins.
37. a lingular infiltrate will typically obscure the left hemi-diaphragm.
38. CT scans with vascular contrast are useful for showing pulmonary emboli.