

L: Respiratory System

- What is the correct sequence of structures through which an oxygen molecule passes from the nostrils to the alveolus?
 - larynx, right bronchus, trachea, bronchioles
 - right bronchus, larynx, bronchioles, trachea
 - larynx, trachea, right bronchus, bronchioles
 - trachea, larynx, bronchioles, right bronchus

- Mucus is moved along the respiratory tract by
 - cilia.
 - flagella.
 - peristalsis.
 - active transport.

- Which of the following would cause a decrease in the pH of the blood during internal respiration?
 - running for ten minutes
 - digestion of an acidic food
 - taking in several deep breaths
 - prolonged period of inactivity

- Most of the carbon dioxide produced by tissues is carried back to the lungs as
 - bicarbonate ions.
 - reduced hemoglobin.
 - carbaminohemoglobin.
 - a gas dissolved in plasma.

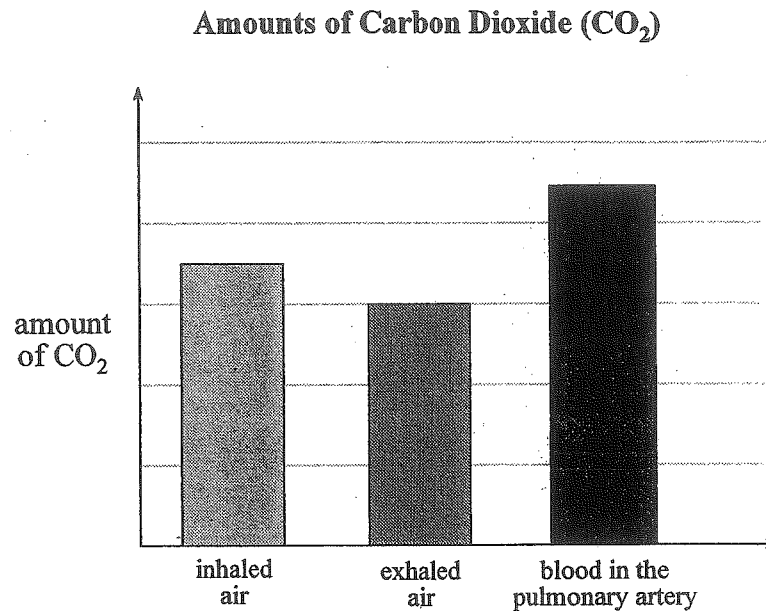
- Which of the following would be a valid comparison of the blood at location X when compared to the blood at location Y?

(HbO₂ = oxyhemoglobin, HCO₃⁻ = bicarbonate ions, HHb = reduced hemoglobin)

	LOCATION X		
A.	low HbO ₂	high HCO ₃ ⁻	high HHb
B.	high HbO ₂	high HCO ₃ ⁻	high HHb
C.	high HbO ₂	low HCO ₃ ⁻	low HHb
D.	high HbO ₂	low HCO ₃ ⁻	high HHb

6. A function of the larynx is to
- A. produce sound.
 - B. facilitate gas exchange.
 - C. prevent the lungs from collapsing.
 - D. increase the volume of the thoracic cavity.
7. Cilia are found lining which of the following structures?
- A. larynx
 - B. alveoli
 - C. trachea
 - D. pleural membranes
8. During external respiration, the concentration of which of the following increases in the blood?
- A. ATP
 - B. hemoglobin
 - C. oxyhemoglobin
 - D. reduced hemoglobin
9. Which substance is transported as reduced hemoglobin in the blood?
- A. water
 - B. oxygen
 - C. hydrogen ions
 - D. carbon dioxide
10. Hemoglobin in the umbilical artery carries less of which substance than hemoglobin in the umbilical vein?
- A. oxygen
 - B. hydrogen ions
 - C. carbon dioxide
 - D. bicarbonate ions
-
11. Which of the following events causes the pH of the blood to increase?
- A. reduced hemoglobin is produced
 - B. oxygen combines with hemoglobin
 - C. carbon dioxide combines with water
 - D. bicarbonate and hydrogen ions are produced

Use the following graph to answer question 12.

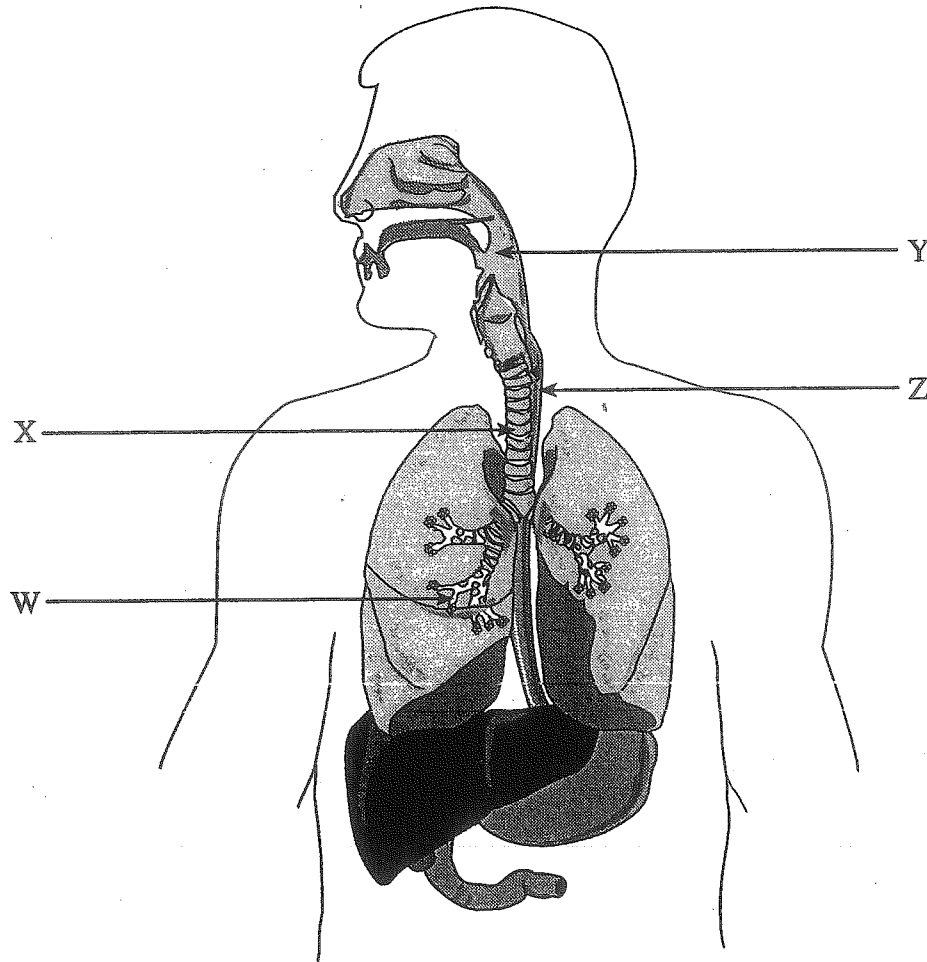


12. The graph above is **incorrect** because the amount of CO₂ should be
- A. highest in inhaled air.
 - B. equal in all three instances.
 - C. lowest in the pulmonary artery.
 - D. higher in exhaled air than in inhaled air.
13. Which of the following trap particles and move them up the trachea?
- A. villi and mucus
 - B. mucus and cilia
 - C. alveoli and villi
 - D. cilia and alveoli
14. Speech sounds are made when air moves through the
- A. cilia.
 - B. larynx.
 - C. pharynx.
 - D. diaphragm.
15. What occurs when the diaphragm relaxes and becomes dome shaped?
- A. The rib muscles relax, thoracic cavity volume increases and exhalation occurs.
 - B. The rib muscles relax, thoracic cavity volume decreases and exhalation occurs.
 - C. The rib muscles contract, thoracic cavity volume increases and inhalation occurs.
 - D. The rib muscles contract, thoracic cavity volume decreases and inhalation occurs.

16. The vocal chords are found in which structure?

- A. larynx
- B. bronchi
- C. pharynx
- D. bronchioles

Use the following diagram to answer question 17



17. Which of the following indicates a cartilaginous tube lined with a ciliated mucous membrane?

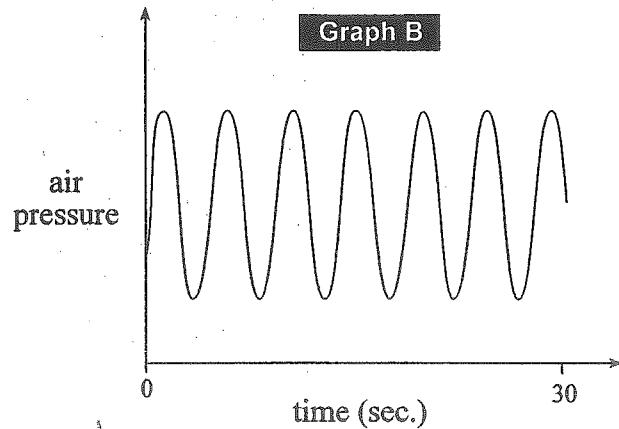
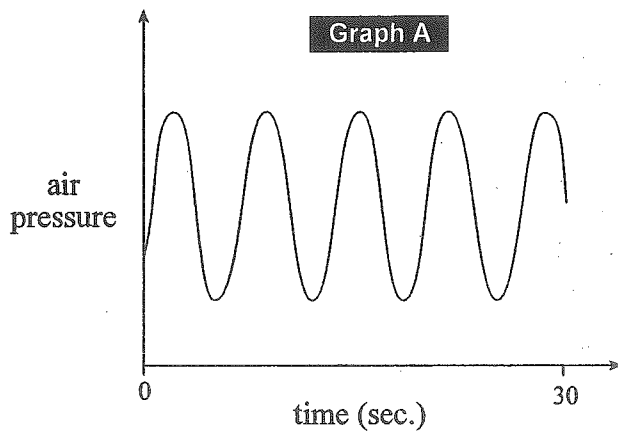
- A. W
- B. X
- C. Y
- D. Z

18. During inhalation,

- A. the diaphragm contracts and the rib muscles relax.
- B. the diaphragm relaxes and the rib muscles contract.
- C. air pressure in the lungs increases and outside air rushes in.
- D. air pressure in the lungs decreases and outside air rushes in.

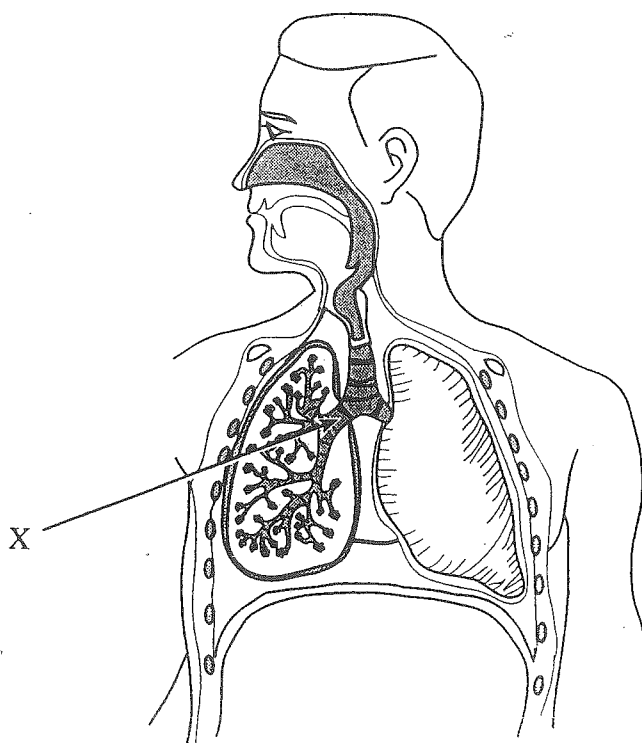
19. Which part of the brain initiates the resumption of breathing when someone holds their breath?
- cerebellum
 - hypothalamus
 - corpus callosum
 - medulla oblongata

Use the following graphs to answer question 20



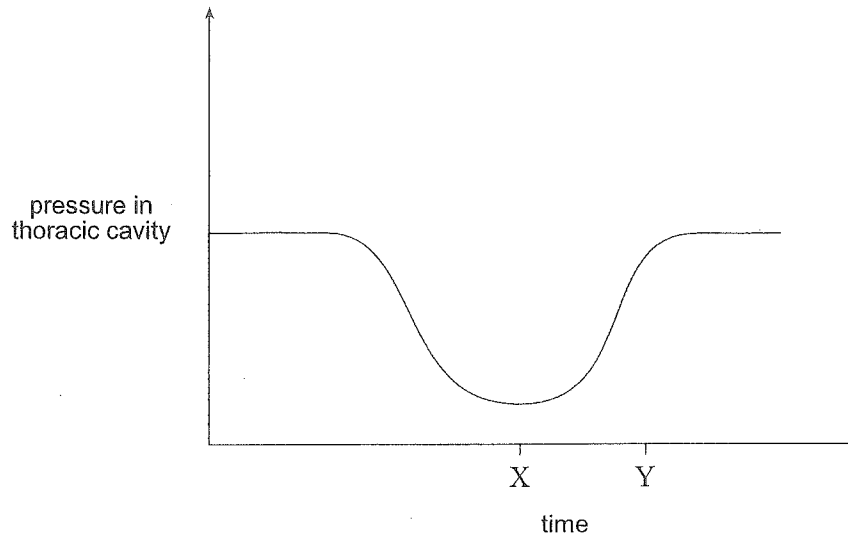
20. In the graphs above, graph A represents the change in pressure in the lungs over a 30-second time period. Which of the following would cause, over the same time period, the change as shown in graph B?
- low concentration of hydrogen ions in the blood
 - high concentration of bicarbonate ions in the blood
 - decreased nerve impulses sent to the diaphragm from the medulla oblongata
 - increased nerve impulses from the stretch receptors in the lungs to the hypothalamus
-
21. Which of the following is responsible for keeping the respiratory tract clear of mucus and debris?
- cilia
 - alveoli
 - pharynx
 - diaphragm
-
22. The contraction of the diaphragm is accompanied by the
- relaxation of rib muscles, increased thoracic cavity volume and exhalation.
 - relaxation of rib muscles, decreased thoracic cavity volume and exhalation.
 - contraction of rib muscles, increased thoracic cavity volume and inhalation.
 - contraction of rib muscles, decreased thoracic cavity volume and inhalation.

Use the following diagram to answer question 23.



23. A function of the structure labelled X is to
- A. produce sound.
 - B. exchange gases.
 - C. carry air into and out of the lung.
 - D. stimulate the breathing centre in the brain.
24. The product of the reaction between Hb and O_2 is
- A. bicarbonate.
 - B. hemoglobin.
 - C. oxyhemoglobin.
 - D. carbaminohemoglobin.
25. Carbaminohemoglobin is formed in the
- A. large intestine by *E. Coli*.
 - B. alveolus when excess oxygen is present.
 - C. capillary for the transport of carbon dioxide.
 - D. nephron from the breakdown of amino acids.
26. Which of the following would have the highest concentrations of both bicarbonate ions and reduced hemoglobin?
- A. an iliac vein
 - B. a carotid artery
 - C. a coronary artery
 - D. a pulmonary vein

Use the following graph to answer question 27.



27. The graph shows changes in air pressure in the thoracic cavity during breathing. Which of the following occurs between times X and Y?
- A. rib muscles relax and diaphragm relaxes
 - B. rib muscles relax and diaphragm contracts
 - C. rib muscles contract and diaphragm relaxes
 - D. rib muscles contract and diaphragm contracts

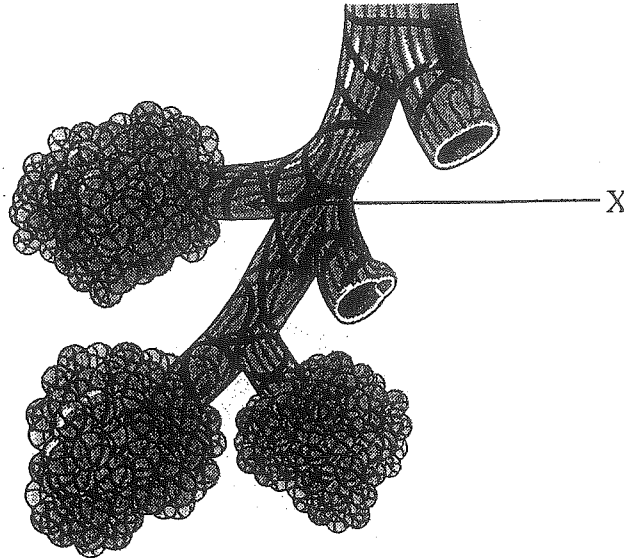
Use the following data table for a capillary bed in the lungs to answer question 28.

PATIENT	NET BLOOD PRESSURE IN THE ARTERIOLE (mm of Hg)	NET OSMOTIC PRESSURE IN THE VENULE (mm of Hg)
W	15	15
X	17	15
Y	15	17
Z	14	16

28. Which patient has pulmonary edema, a condition where tissue fluid accumulates in the lungs?
- A. W
 - B. X
 - C. Y
 - D. Z

29. Air pressure is reduced inside the thoracic cavity when
- A. the rib muscles relax.
 - B. the diaphragm moves up.
 - C. the rib cage moves up and out.
 - D. the pleural membranes collapse.

Use the following diagram to answer question 30.



30. The structure labelled X is a(n)

- A. trachea.
- B. alveolus.
- C. bronchus.
- D. bronchiole.

31. The diaphragm assists breathing by

- A. moving the ribs up.
- B. stimulating the lungs to absorb oxygen.
- C. changing the volume of the thoracic cavity.
- D. allowing the lungs to move freely in the thoracic cavity.

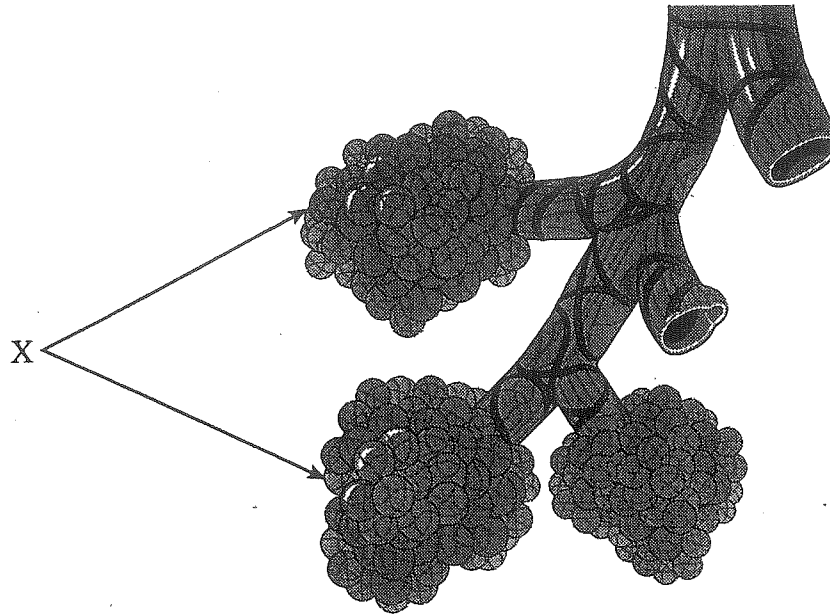
32. Internal respiration is the exchange of

- A. glucose and hydrogen ions between the air and the blood.
- B. oxygen and carbon dioxide between the air and the blood.
- C. glucose and hydrogen ions between the blood and tissue fluid.
- D. oxygen and carbon dioxide between the blood and tissue fluid.

33. The level of CO_2 in the blood is monitored by the

- A. cerebellum.
- B. hypothalamus.
- C. cerebral cortex.
- D. medulla oblongata.

Use the following diagram to answer question 34.



34. The structures labelled X are

- A. villi.
- B. alveoli.
- C. bronchioles.
- D. lymph nodes.

35. Inhalation results from

- A. contraction of the diaphragm.
- B. movement of the pleural membranes.
- C. decreased carbon dioxide in the blood.
- D. relaxation of the rib (intercostal) muscles.

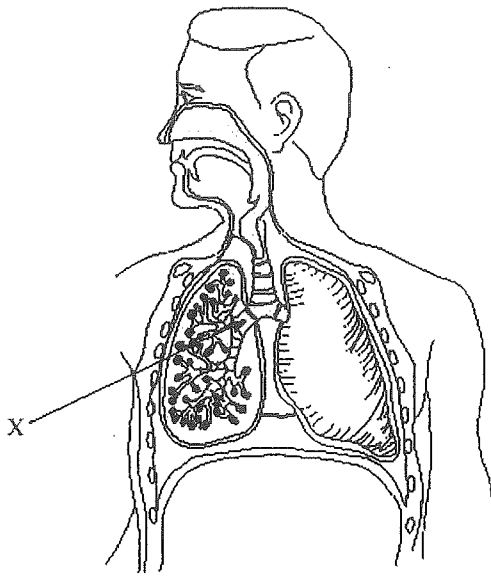
36. The majority of carbon dioxide in the blood travels

- A. as bicarbonate ions.
- B. dissolved in plasma.
- C. as carbonic anhydrase.
- D. as carbaminohemoglobin.

37. Which of the following reactions occurs in a capillary of the leg?

- A. $\text{Hb} + \text{H}^+ \rightarrow \text{HHb}$
- B. $\text{HbCO}_2 \rightarrow \text{Hb} + \text{CO}_2$
- C. $\text{Hb} + \text{oxygen} \rightarrow \text{HbO}_2$
- D. $\text{H}^+ + \text{HCO}_3^- \rightarrow \text{H}_2\text{CO}_3$

Use the following diagram to answer question 38.



38. The structure labelled X is the
- A. larynx.
 - B. trachea.
 - C. bronchus.
 - D. diaphragm.

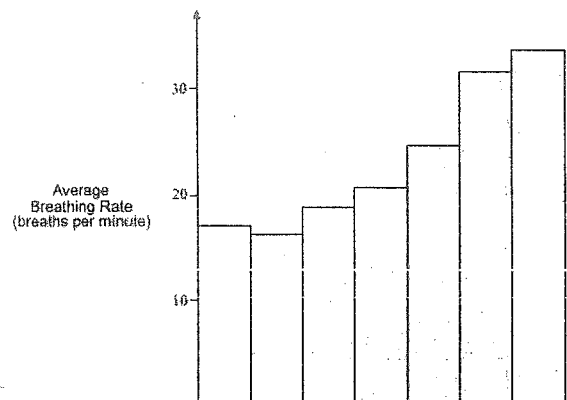
39. Inhalation is caused by

- A. the diaphragm moving up and the ribs moving in.
- B. the diaphragm moving up and the ribs moving out.
- C. the diaphragm moving down and the ribs moving in.
- D. the diaphragm moving down and the ribs moving out.

40. Which of the following would cause the effect shown?

- A. increased oxygen in the blood
- B. increased numbers of red blood cells
- C. increased carbon dioxide in the blood
- D. decreased concentration of hydrogen ions

Use the following graph to answer question 40.



41. The increased surface area for gas exchange in the lungs is due to the

- A. villi.
- B. alveoli.
- C. trachea.
- D. bronchi.

42. The level of carbon dioxide in the blood is monitored by the

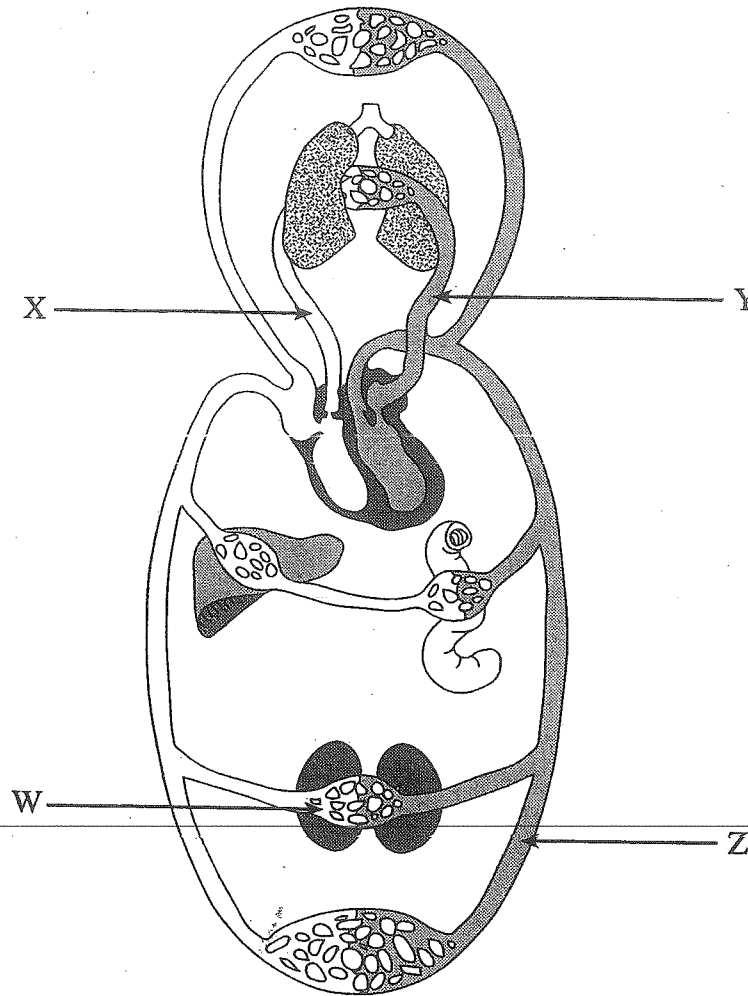
- A. cerebrum.
- B. cerebellum.
- C. hypothalamus.
- D. medulla oblongata.

43. Which of the following correctly compares the concentration of CO_2 in exhaled air to the concentration of CO_2 in the pulmonary artery?

	$[\text{CO}_2]$ in Exhaled Air	$[\text{CO}_2]$ in the Pulmonary Artery
A.	low	low
B.	high	high
C.	low	high
D.	high	low

44. The exchange of oxygen and carbon dioxide in external respiration occurs by
- osmosis.
 - diffusion.
 - active transport.
 - facilitated diffusion.

Use the following diagram to answer question 45.



45. Which letter indicates where the greatest concentration of carbaminohemoglobin is found?

- W
- X
- Y
- Z

46. Which of the following contains structures that vibrate to produce sound?
- A. larynx
 - B. trachea
 - C. epiglottis
 - D. pleural membranes
47. Which of the following lines the chest cavity?
- A. cilia
 - B. alveoli
 - C. diaphragm
 - D. pleural membranes
48. In the respiratory system, which structure would have the **greatest** surface area to volume ratio?
- A. alveoli
 - B. trachea
 - C. bronchi
 - D. bronchioles
49. During the exhalation of air, the
- A. alveoli contract.
 - B. diaphragm relaxes.
 - C. rib muscles contract.
 - D. thoracic cavity increases in volume.
50. The part of the brain responsible for increasing breathing rate during exercise is the
- A. cerebral cortex.
 - B. corpus callosum.
 - C. pulmonary trunk.
 - D. medulla oblongata.
-
51. If the hydrogen ion concentration in the blood increases, the breathing control centre in the brain will
- A. decrease thoracic cavity volume.
 - B. decrease rib muscle contractions.
 - C. increase contractions of the diaphragm.
 - D. increase pressure in the thoracic cavity.

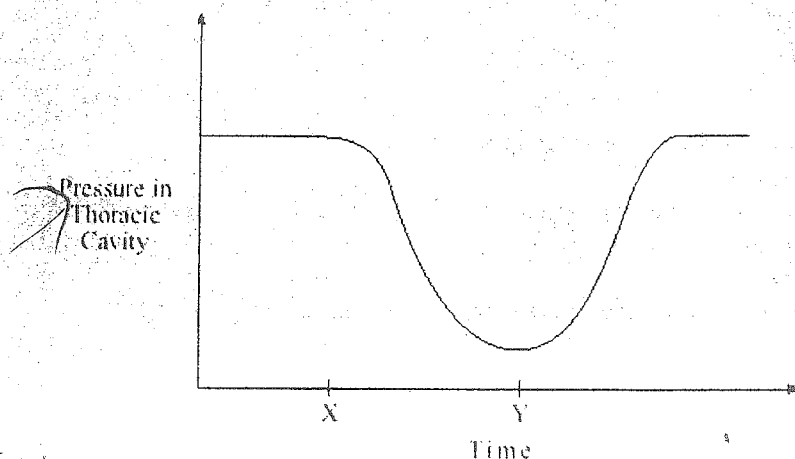
Use the following information to answer question 52.

1. Alveoli
2. Bronchi
3. Trachea
4. Bronchioles

52. What is the order in which air passes through these structures during inhalation?

- A. 2, 1, 3, 4
- B. 2, 4, 1, 3
- C. 3, 2, 4, 1
- D. 3, 4, 2, 1

Use the following graph to answer question 53.



53. The graph shows changes in air pressure in the thoracic cavity during breathing.

Which of the following occurs between times X and Y?

- A. Rib muscles relax and diaphragm relaxes.
- B. Rib muscles relax and diaphragm contracts.
- C. Rib muscles contract and diaphragm relaxes.
- D. Rib muscles contract and diaphragm contracts.

54. An experiment was carried out to determine factors affecting human blood's ability to carry oxygen. The results are shown in the graph above. Which of the following may have caused the change at time X?

- A. Water was removed from the plasma.
- B. More platelets were added to the blood.
- C. Stimulation of the medulla oblongata increased breathing rate.
- D. A competitive inhibitor of hemoglobin was added to the blood.

55. Which of the following is **not** carried by hemoglobin?

- A. Oxygen.
- B. Sodium ions.
- C. Hydrogen ions.
- D. Carbon dioxide.

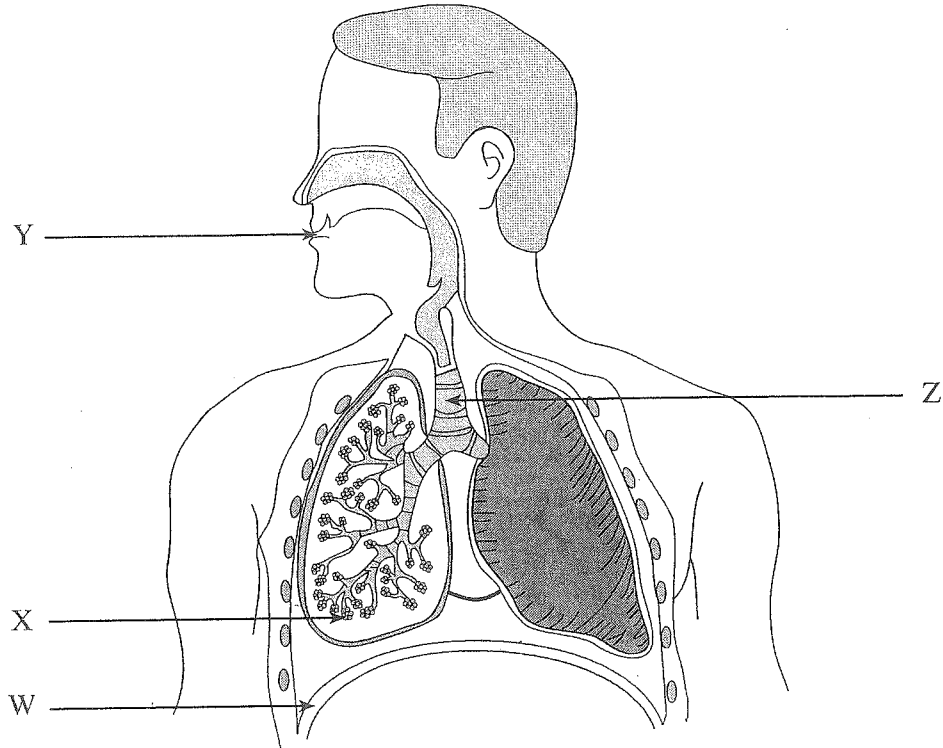
56. During internal respiration, excess hydrogen ions react with

- A. oxygen to form oxyhemoglobin.
- B. hemoglobin to form reduced hemoglobin.
- C. carbon dioxide to form bicarbonate ions.
- D. bicarbonate ions to form water and carbon dioxide.

57. The movement of mucus up the trachea is caused by

- A. beating of cilia.
- B. waves of peristalsis.
- C. contraction of the diaphragm.
- D. constriction of smooth muscle.

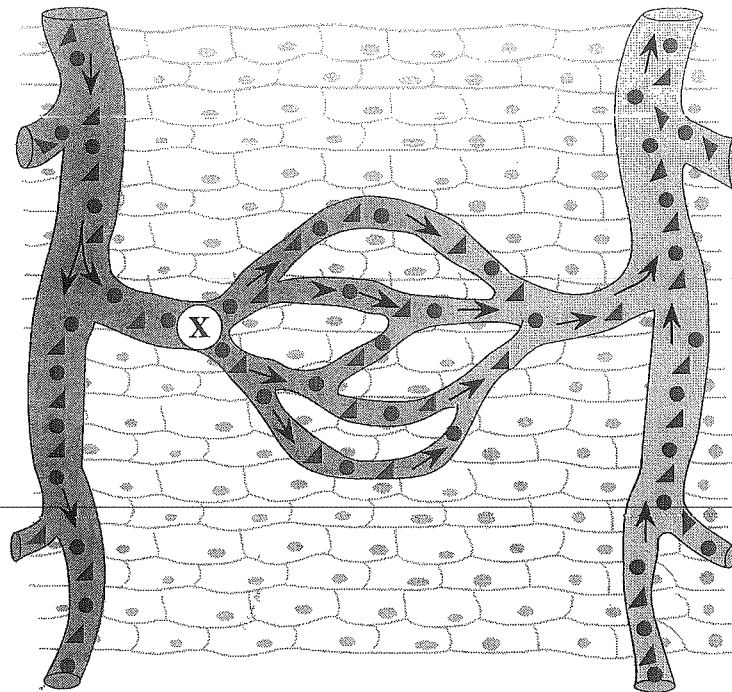
Use the following diagram to answer question 58.



58. In which of the following structures are cilia found?

- A. W
- B. X
- C. Y
- D. Z

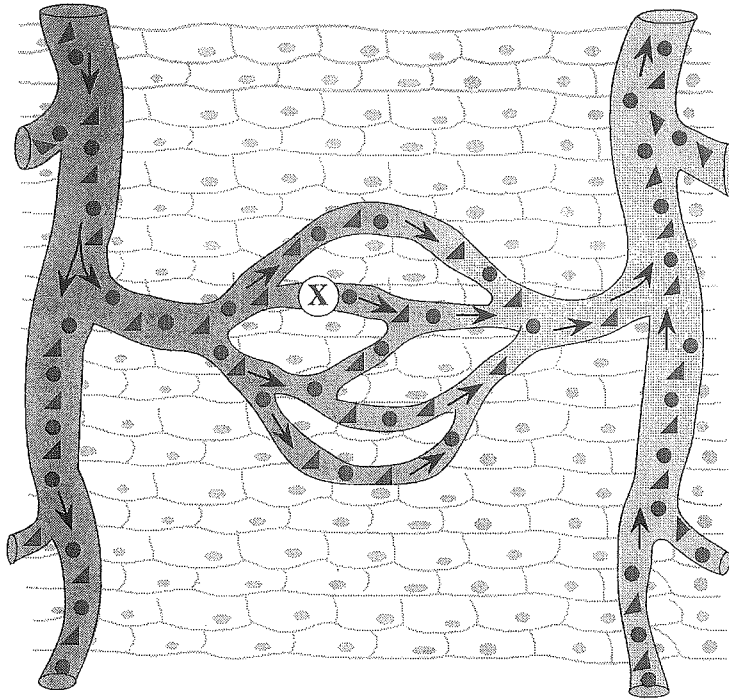
Use the following diagram to answer question 59.



59. If normal blood pressure drops at point X, what will be the result?

- A. Blood velocity will increase.
- B. The amount of water entering the tissues will increase.
- C. Active transport of nutrients into the tissues will decrease.
- D. The rate of diffusion of materials from tissues into the blood will increase.

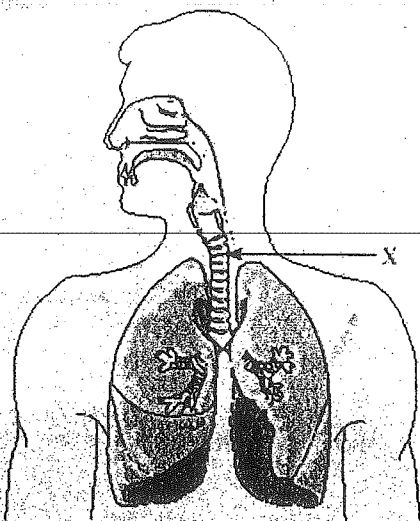
Use the following diagram to answer question 60.



60. If osmotic pressure is a constant 25 mm Hg, which of the following best describes what occurs at X?

	EVENT	BLOOD PRESSURE (mm Hg)
A.	nutrients move from the capillaries to the tissues	10
B.	nutrients move from the capillaries to the tissues	40
C.	wastes move into the capillaries from the tissues	25
D.	wastes move into the capillaries from the tissues	40

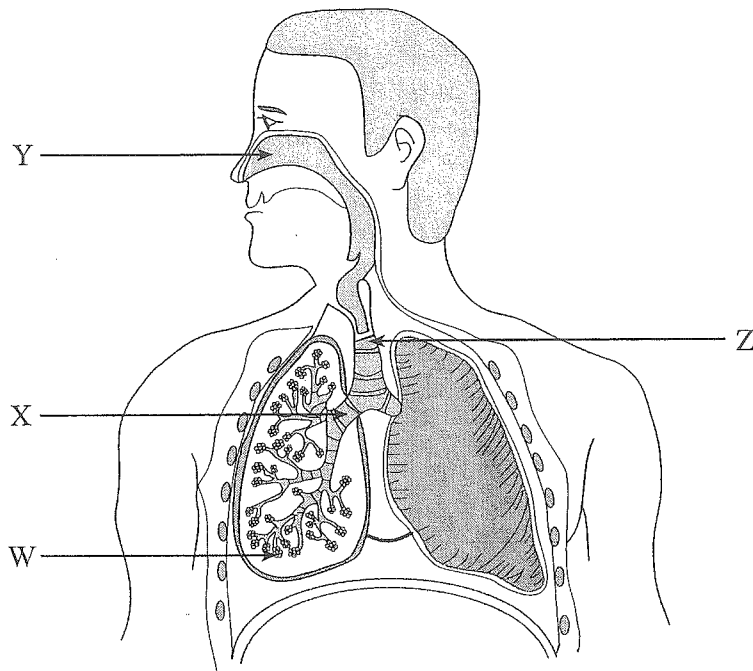
Use the following diagram to answer question 61.



61. The structure labelled X is held open by
 A. cartilage.
 B. vocal cords.
 C. a lipoprotein layer.
 D. a pleural membrane.

62. Which of the following is the site of external respiration?
 A. Alveoli.
 B. Bronchioles.
 C. Mitochondria.
 D. Muscle tissue.

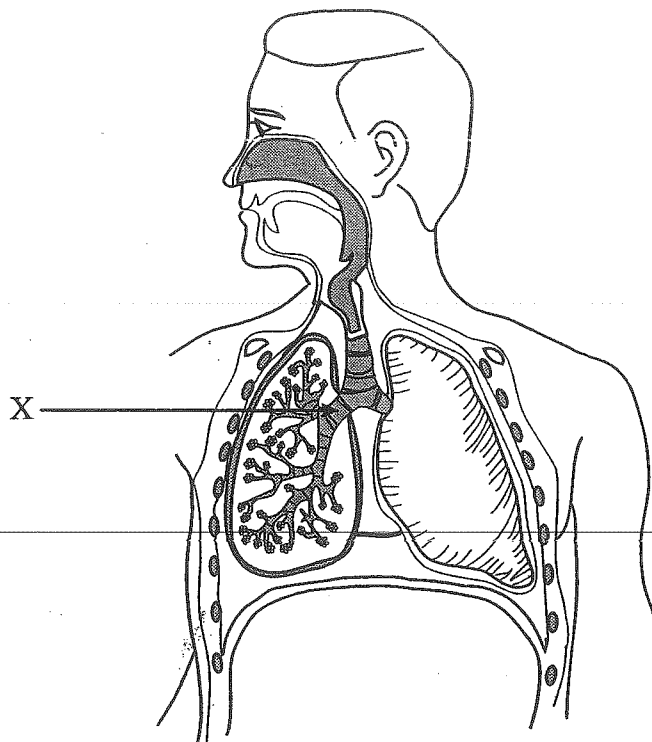
Use the following diagram to answer question 63.



63. Which letter indicates the alveoli?

- A. W
- B. X
- C. Y
- D. Z

Use the following diagram to answer question 64.



64. The presence of food at location X indicates a malfunctioning

- A. pharynx.
- B. epiglottis.
- C. esophagus.
- D. cardiac sphincter.

65. Describe **three** ways in which the structure of the alveoli facilitates their function. (3 marks)

i) _____

ii) _____

iii) _____

66. Describe how the upper respiratory tract is specialized to keep the lungs free of debris. (3 marks)

67. Describe the interaction of the lungs, pleural membranes, ribs, and diaphragm during inhalation. (4 marks)

Use the following information to answer questions 68(a) and b).

ACTIVITY	RATE OF AIR INTAKE
exercise	7-8 L/min.
sitting (at rest)	4-5 L/min.
sleeping	2 L/min.

68. a) What substance found in the plasma would cause the change in the rate of air intake during exercise? (1 mark)

b) Write the chemical reactions that occur during internal respiration that return the rate of air intake during exercise to the resting rate. (2 marks)

c) i) Why would a drop in pH cause the enzymes that clot blood to function at a slower rate? (2 marks)

ii) State two other conditions that would have the same effect on the enzymes in the blood. (2 marks)

- 69 a) Mountaineers attempting to scale Mt. Everest encounter an environment that contains one-third the oxygen present at sea level. Describe how each of the following will change during the climb and how the change will compensate for the lower than normal oxygen levels.

rate of cell division in the bone marrow:

(2 marks)

breathing rate:

(2 marks)

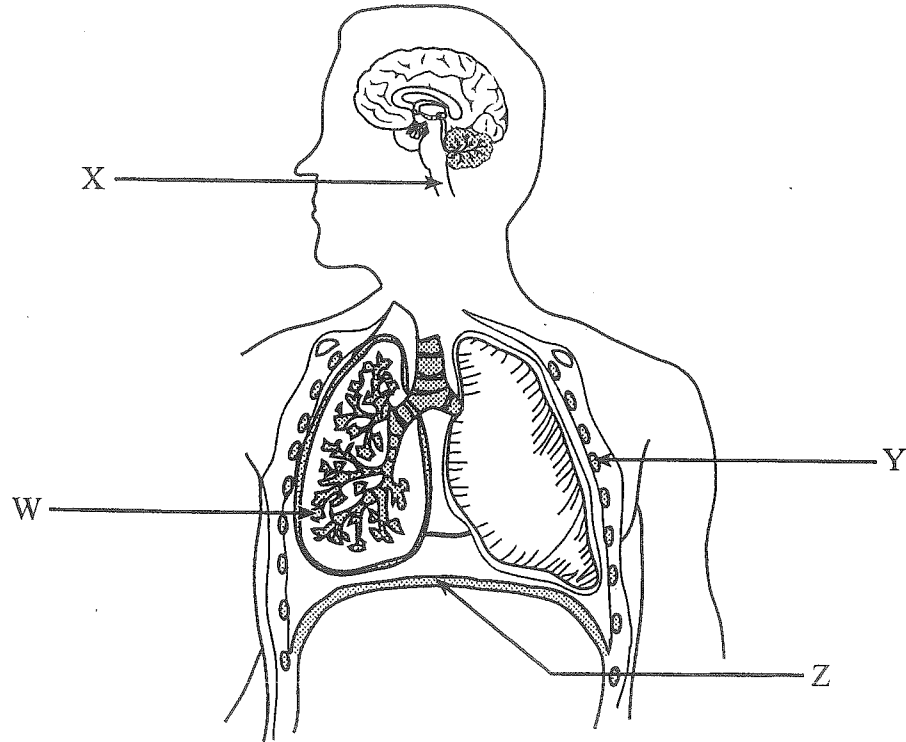
- b) During the climb, the blood pH decreases. Explain how the body compensates for this change.

(2 marks)

70. How is the structure of the alveoli ideally suited to the exchange of gases with the blood?

(4 marks)

Use the following diagram to answer question 71.



71. a) Label structures W, X, Y and Z on the diagram. (4 marks: 1 mark each)

b) Describe the roles of structures W, X and Z in the process of inhalation. (3 marks)

c) Why are the pleural membranes important to the inhalation process? (1 mark)

72. a) During external respiration, reactions involving gases occur in the capillaries. Describe **three** of these reactions. **(3 marks)**

i) _____

ii) _____

iii) _____

b) Describe **two** conditions in the capillaries during external respiration that affect the rate of the reactions above. **(2 marks)**

i) _____

ii) _____

73. a) How does an increase in the concentration of carbon dioxide in the blood affect the breathing rate? **(1 mark)**

b) Where is an increase in the concentration of carbon dioxide in the blood detected? Explain how the body responds to return carbon dioxide concentration to normal levels. **(2 marks)**

74. a) Describe internal respiration.

(3 marks)

b) Explain why the pH of the blood in the lung capillaries and in the body-tissue capillaries is similar.

(2 marks)

75. Identify three substances transported by hemoglobin in the blood and give the name of each form of hemoglobin. (3 marks: 1 2 mark each)

SUBSTANCE TRANSPORTED	FORM OF HEMOGLOBIN