DEPARTMENT OF PHYSIOLOGY AND BIOPHYSICS
SCHOOL OF MEDICINE AND THE GRADUATE SCHOOL

HUMAN PHYSIOLOGY

SECOND EXAMINATION

MONDAY, MARCH 7, 1994

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Instructions for Use of Optical Scan Answer Sheet

1. **DO NOT** bend fold or tear answer sheet in any way.

2. Use **ONLY** a **#2 pencil**. **DO NOT** use a pen.

3. **DO NOT** make any marks along the edge with the black lines. The computer will not be able to grade your sheet if you do so.

4. Print your name (**last name first**) in the boxes provided on the sheet.

5. **Darken** the blanks which correspond to each letter in your name and initial.

6. In the box marked "Student I.D. Number" write your **5-digit identifying number** given to you by the Registrar's Office at the beginning of the year. **Darken** the corresponding number box below.

7. For each question, **darken** the letter blank which corresponds to the correct answer. **DO NOT** write in more than one answer -- **the computer will reject your answer sheet and it will be marked wrong (i.e. no credit).** Erase thoroughly any mismarked blanks.

8. **NO EXTRA TIME WILL BE ALLOWED TO TRANSCRIBE ANSWERS ONTO THE ANSWER SHEET.**

9. **IF YOU DO NOT FOLLOW THE ABOVE INSTRUCTIONS, IT WILL NOT BE POSSIBLE TO GRADE YOUR EXAM.**

1. When the left ventricle fails

   A. pulmonary capillary pressure decreases.
   B. pulmonary blood volume decreases.
   C. edema fluid tends to accumulate first in the dependent portions of the lung.
   D. systemic venous pressure is markedly increased.
   E. the maximal velocity of shortening (Vmax) of ventricular myocardium is enhanced above normal.

2. Which of the following statements concerning zonal distribution of blood flow in the lung is **FALSE**?

   A. Blood flow through zone II is determined by the difference between pulmonary arterial pressure and alveolar pressure.
   B. No blood flow occurs in zone I because resistance to blood flow is infinite.
   C. When pulmonary arterial pressure increases, blood flow throughout the lung becomes more uniform.
   D. The term vascular waterfall has been used to describe blood flow through zone II of the lung.
   E. In zone III the venous end of the capillary tends to collapse because of its negative transmural pressure.

3. Which of the following statements concerning the pulmonary circulation is **TRUE**?

   A. Lobar alveolar hypoxia results in a ventilation-perfusion (V_A/Q) ratio > 1.0 in the hypoxic lobe of the lung.
   B. Pressure at the arterial end of the pulmonary capillaries is approximately 30 mm Hg.
   C. Communications between the bronchial and pulmonary circulations only occur in the precapillary vessels of the pulmonary circulation.
   D. At total lung capacity (TLC) vascular resistance is low because the pulmonary capillaries are pulled open by the expanded alveoli.
   E. The caliber of the extra-alveolar vessels of the lung is determined primarily by changes in alveolar pressure.

4. The ductus venosus of the fetal circulation

   A. is an opening in the interatrial septum which allows mixing of the right atrial and left atrial blood.
   B. is a shunt between the aorta and the placenta.
   C. is a shunt between the umbilical vein and the inferior vena cava.
   D. receives 100% of the left ventricular output.
   E. does not close after birth.

5. Which of the following statements concerning the bronchial circulation is **FALSE**?

A. The bronchial circulation supplies nutrition to most of the extra-alveolar structures of the lung.
B. When pulmonary blood flow to a specific region of the lung is obstructed, bronchial blood flow to the ischemic region is increased.
C. Unlike the pulmonary vessels which vasoconstrict to alveolar hypoxia, the bronchial vessels dilate with systemic hypoxia.
D. Pulmonary arterial PO_2 and bronchial arterial PO_2 are identical.
E. Bronchial blood flow constitutes approximately 1.0% of left ventricular output.

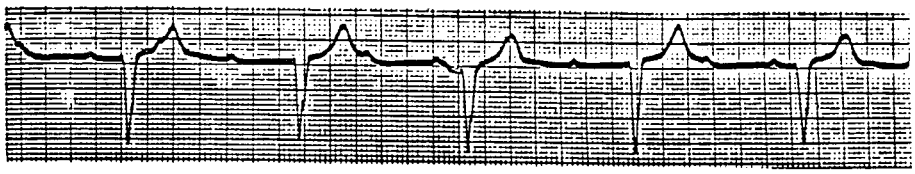
6. Which of the following statements concerning the fetal circulation is **FALSE**?

A. Only a small fraction of right ventricular output passes through the pulmonary circulation.
B. The right and left ventricles function in parallel.
C. Gas exchange occurs at the placental circulation rather than the pulmonary circulation.
D. Umbilical venous O_2 content exceeds pulmonary venous O_2 content.
E. A left-to-right shunt exists through the ductus arteriosus.

7. The following ECG was recorded in a 40 year old patient with mitral stenosis. Which of the following statements concerning this patient is **FALSE**?

A. Heart rate is irregular.
B. Stroke volume varies from beat-to-beat.
C. The fourth heart sound varies in intensity.
D. Both a first and second heart sound are present.
E. Ventricular end-diastolic volume varies from beat-to-beat.

8. A 70 year old gentleman had a syncopal episode while jogging up a hill. When he arrived in the emergency room, he was fully alert. An ECG, shown below, was taken in the emergency room. Select the **FALSE** statement pertaining to this patient.



A. Atrial rate is greater than ventricular rate.
B. Stroke volume at rest is likely to be greater than normal.
C. The maximum cardiac output he can achieve will be reduced.
D. The first heart sound will be absent.
E. His syncopal episode was most likely the result of reduced cerebral blood flow.

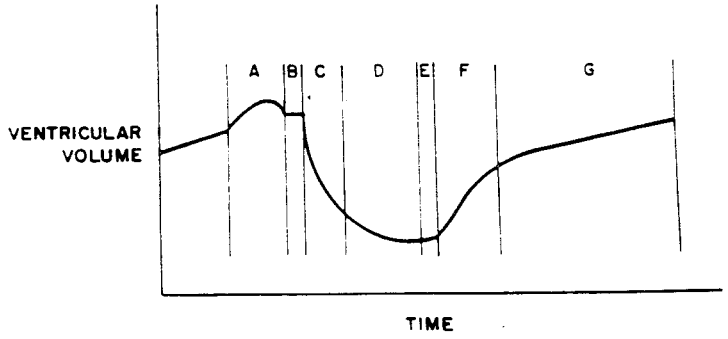
9. The isometric contraction period of the ventricles

A. occurs at the same time as the P wave of the ECG.
B. occurs when ventricular volume is at its minimum value.
C. is associated with a rapid increase in ascending aortic blood flow.
D. is characterized by a rapid rise in ventricular pressure but no change in ventricular volume.
E. occurs during rapid passive filling of the ventricles.

10. Select the **FALSE** statement.

A. Angina pectoris is usually indicative of significant coronary artery disease.
B. Atherosclerosis is the most common cause of coronary artery disease.
C. Atherosclerosis primarily involves the left circumflex coronary artery because the intramyocardial pressure is greater in this region of the heart.
D. Spasm of a coronary artery can precipitate angina pectoris.
E. Angina pectoris results from transient myocardial ischemia.

The figure below is a ventricular volume curve during one complete cardiac cycle. For questions 11 through 13 refer to this figure.



11. Diastasis occurs during period

A. B
B. D
C. E
D. F
E. G

12. Opening of the pulmonic valve occurs at the beginning of period

A. B
B. C
C. D
D. E
E. A

13. The fourth heart sound occurs during period

A. B
B. D
C. E
D. G
E. A

14. During the inspiratory phase of respiration in a normal adult

A. the aortic valve opens before the pulmonic valve.
B. the tricuspid valve closes before the mitral valve.
C. closure of the pulmonic valve is delayed.
D. opening of the aortic valve is delayed.
E. the second heart sound becomes a single sound.

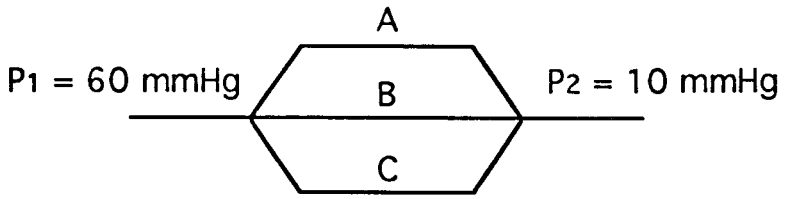
15. Select the **FALSE** statement. Following birth

A. the umbilical vein usually closes before the umbilical arteries.
B. the left atrial pressure rises above the right atrial pressure and the foramen ovale closes.
C. pulmonary blood flow increases and pulmonary vascular resistance decreases.
D. systemic vascular resistance increases
E. the right and left ventricles begin to function in series.

16. The greatest resistance to blood flow in the systemic circulation occurs in the

A. ascending aorta.
B. capillaries.
C. arterioles.
D. venules.
E. inferior vena cava.

For questions 17 -18 use the parallel vascular circuit below.



R_A = 2 mmHg/ml/sec
R_B = 3 mmHg/ml/sec
R_C = 6 mmHg/ml/sec

17. Calculate the total resistance to blood flow through this parallel vascular circuit.

A. 0.2 mmHg/ml/sec
B. 0.4 mmHg/ml/sec
C. 0.6 mmHg/ml/sec
D. 1.0 mmHg/ml/sec
E. 1.4 mmHg/ml/sec

18. Calculate the volume blood flow through this vascular circuit.

A. 30 ml/sec
B. 40 ml/sec
C. 50 ml/sec
D. 60 ml/sec
E. 70 ml/sec

19. Select the **FALSE** statement.

A. Both the right and left coronary arteries arise from the aorta.
B. Blood flow in the left coronary artery is maximum in systole.
C. Myocardial ischemia develops when the oxygen demand of the myocardium exceeds oxygen delivery.
D. Hypertension is one of the risk factors for coronary heart disease.
E. Diagnosis of angina pectoris is based primarily on the patient's history.

20. Select the **FALSE** statement. Active hyperemia

A. results from increased metabolic activity of the tissue.
B. is preceded by a period of occlusion of an artery.
C. continues until tissue oxygen debt is paid back.
D. is a local mechanism not dependent on neurogenic control.
E. is due to accumulation of vasodilator substances.

21. Select the **FALSE** statement. In skeletal muscle:

A. resting blood flow per gram of tissue is lower than in the kidneys
B. resting blood flow is primarily regulated by sympathetic nerve activity.
C. blood flow increases during exercise.
D. epinephrine causes vasodilation.
E. vasodilation can be elicited by sympathetic cholinergic nerves.

22. Select the **FALSE** statement. When an arteriole is distended by an elevation of pressure

A. the blood vessel constricts.
B. the muscle cell membrane depolarizes.
C. the myogenic reflex is activated.
D. the wall tension increases.
E. adenosine is released.

23. Select the **FALSE** statement. Total peripheral resistance increases when

A. vascular alpha-1 adrenergic receptors are activated.
B. systemic arterioles constrict.
C. the baroreceptors are activated.
D. circulating levels of norepinephrine are elevated.
E. Cushing's reflex is activated.

24. Select the **FALSE** statement. Changing from lying to standing position (orthostatic test) causes

A. an immediate decrease in mean arterial pressure.
B. a reflex increase in total peripheral resistance.
C. activation of the nucleus of the solitary tract.
D. increased sympathetic nerve activity.
E. decreased activity of arterial baroreceptors.

25. The sounds of Korotkoff

A. are valve closure sounds.
B. are heart sounds transmitted to the peripheral arteries.
C. permit measurement of the duration of systole.
D. are reflected waves from the arterioles.
E. result from turbulence and arterial wall vibrations.

26. 20 mg of an indicator is injected into a subject's right atrium. The average indicator concentration in the pulmonary artery is 5 mg/L, with the duration of the first circulation curve being 30 sec. The cardiac output (L/min) in this subject is:

A. 4
B. 5
C. 8
D. 10
E. 12

27. Select the **FALSE** statement. An enhanced inotropic status of myocardium is associated with

A. a rise in left ventricular maximum dP/dt.
B. a shift to the right and downward of the ventricular function curve.
C. enhanced cardiac output, with preload held constant.
D. a rise in ejection fraction.
E. a rise in Vmax in the force-velocity curve.

28. Select the **FALSE** statement. In an anesthetized subject with an electrically paced heart, heart rate is increased from 100 to 140 beats/min.

A. The cardiac output would rise approximately 40%.
B. The ventricular end diastolic volume would decrease.
C. The stroke volume would decrease.
D. The stroke work would diminish.
E. The duration of diastasis would be diminished.

29. Select the **FALSE** statement regarding the relationship between the left ventricular stroke work and left ventricular end-diastolic pressure.

A. The slope of the relationship is a measurement of inotropic status of the heart.
B. The direct relationship between these two variables is explained by the Frank-Starling mechanism.
C. The curve for this relationship is shifted downward and to the right during myocardial ischemia.
D. The greatest stroke work is associated with a ventricular end diastolic pressure of approximately 20 mmHg.
E. Stroke work is a more appropriate variable than stroke volume in assessing ventricular function because it takes into account changes in afterload.

30. A large intravenous bolus of physiological saline is administered to a subject with a resting heart rate of 85 beats per minute. Heart rate rises initially and then falls significantly shortly afterwards. This fall in heart rate was most likely a result of

A. the Bainbridge reflex.
B. the suction effect.
C. the baroreceptor reflex.
D. venous pooling of blood.
E. the Bowditch effect.

31. Which of the following would produce a fall in mean circulatory pressure (circulatory filling pressure)?

A. increased blood volume
B. elevated venous return
C. a sudden shift of blood from the arterial to the venous side of the systemic circulation
D. venodilation
E. diminished myocardial inotropic state

32. The collapse of superficial veins in an elevated upper extremity is caused by

A. low venous return.
B. low hydrostatic pressure.
C. low cardiac output.
D. venoconstriction.
E. baroreceptor reflexes.

33. The lowest regional coronary blood flow would be expected in the

A. left ventricular subendocardium during early systole.
B. left ventricular subendocardium during early diastole.
C. left ventricular subepicardium during early systole.
D. left ventricular subepicardium during early diastole.
E. right ventricular myocardium during all phases of the cardiac cycle.

34. Which of the following would produce the greatest rise in global cerebral blood flow in a normotensive subject with normal blood gas levels?

A. A fall in arterial PO_2 to 70 mmHg
B. A rise in arterial PCO_2 to 55 mmHg
C. The increase in mentation associated with problem-solving
D. A rise in arterial pressure to 160/120 mmHg
E. Activation of the myogenic reflex

35. Select the **FALSE** statement.

A. Collagen and elastic fibers are in the interstitial space.
B. Total airway cross sectional area decreases toward the alveoli.
C. During inspiration, the highest resistance to airflow is in the trachea.
D. The alveolar lining is mostly made up of Type I cells.
E. The average diameter of the lung capillaries is about 7 micrometers.

36. Select the **FALSE** statement regarding the coronary circulation.

A. Gradual occlusion of a main coronary artery due to atherosclerosis might not be lethal, due to the presence or development of collateral circulation.
B. The ratio of subendocardial to subepicardial blood flow is greatest during diastole.
C. Of the major metabolic products produced in the heart during ischemia, the one contributing the most to coronary vasodilation is adenosine.
D. A useful indicator of oxygen supply to the left ventricle is the area under the aortic pressure curve during systole.
E. During systole, the pressure gradient for coronary blood flow in either the right or left ventricle is the aortic pressure minus the intramyocardial tissue pressure.

37. Select the **FALSE** statement.

A. CO_2 tension in the alveoli and arterial blood is practically the same.
B. The alveolar-arterial gradient in O_2 pressure is mainly due to venous admixture.
C. The ventilation/perfusion ratio at the bottom of the lung is smaller than at the top of the lung.
D. The ventilation/perfusion ratio (V_A/Q) for physiological dead space is infinity.
E. The difference in O_2 content between venous and arterial blood is about 5 ml/dL at rest.

38. Select the **FALSE** statement.

A. An increase in cardiac output might result in a reduced contact time between alveolar gas and capillary blood.
B. The mean gradient for O_2 diffusion in the normal lung is about 60 mm Hg.
C. The diffusion of carbon monoxide across the alveolar-capillary membrane is diffusion-limited.
D. The diffusion of N_2O is perfusion-limited.
E. The PO_2 gradient between alveolar and venous capillary blood disappears after 0.25 sec. of contact.

39. Select the **FALSE** statement.

A. The body has reserves of CO_2 in excess of 2 Liters.
B The total pressure of the gases in the blood at sea level is about 713 mmHg .
C. The partial pressure of O_2 in the pulmonary capillary (after gas exchange) is higher than in the systemic arteries.
D. Gases in the lung expand with increasing body temperature.
E. The CO_2 content of systemic arterial blood is less than the O_2 content.

40. Which of the following does **NOT** affect lung compliance?

A. surface tension
B. interstitial elastic fibers
C. lung tissue elasticity
D. arterial oxygen tension
E. lung volume

41. Which of the following does **NOT** affect maximal expiratory flow (MEF)?

A. dynamic airway compression
B. elastic recoil pressure of the lung
C. airway resistance in the small airways
D. the strength of the respiratory muscles
E. the formation of a choke point

42. In a healthy 70 Kg man, arterial PO_2 will be highest under which of the following conditions?

	Alveolar Ventilation (L/min)	Blood Hemoglobin Content (g/dL)	PO_2 of Inspired Air (mm Hg)
A.	3	15	200
B.	3	20	85
C.	6	12	95
D.	6	20	100
E.	6	8	200

43. Select the **FALSE** statement. A healthy normal individual breathing a mixture of 50% O_2 and 50% N_2 at an altitude where atmospheric pressure is 507 mm Hg has:

A. alveolar PO_2 of about 180 mmHg
B. arterial O_2 content of about 25 ml/dL
C. arterial O_2 saturation of about 100%
D. arterial PO_2 of about 170 mmHg
E. mixed venous O_2 content of about 15 ml/dL

44. Which of the following is **NOT** a characteristic of chronic obstructive lung disease?

A. increased residual volume
B. decreased airway resistance
C. increased production of sputum
D. decreased FEV_1
E. prolonged expiratory time

For questions 45-48 match the arterial blood gas finding with the appropriate condition(A-E).

A. acute respiratory acidosis
B. respiratory alkalosis induced by hyperventilation
C. metabolic alkalosis
D. acute metabolic acidosis
E. chronic compensated respiratory acidosis

	PaO_2	$PaCO_2$	pH	HCO_3
45.	decreased	increased	near normal	increased
46.	increased	decreased	decreased	decreased
47.	increased	decreased	increased	near normal
48.	decreased	increased	decreased	near normal

QUESTIONS 49-50.

A 25 year old previously healthy individual is brought to the Baltimore shock-trauma center a couple of hours after sustaining chest and head injuries in a car accident. He is unconscious, cyanotic and his breathing is shallow and rapid. Initial arterial blood gases show:

PaO_2	=	55 mmHg
$PaCO_2$	=	65 mmHg
pH	=	7.22
HCO_3	=	26 mEq/L
Hb	=	10 g/dL

49. Select the **FALSE** statement:

A. The patient has acute respiratory acidosis.
B. The increased $PaCO_2$ is a result of hypoventilation.
C. The HCO_3 is within normal limits.
D. Giving 100% O_2 will restore his arterial O_2 content to normal.
E. The blood oxygen carrying capacity is reduced.

The patient is immediately put on a respirator. However, the left lung does not expand and the diagnosis of a left pneumothorax is made.

50. Select the **FALSE** statement:

A. The pressure in the left pleural cavity will be atmospheric at FRC.
B. The patient will most likely have a significant shunt in the left lung.
C. In the absence of injury to the chest wall, the ventilation of the right lung would significantly increase.
D. Anatomical dead space in the lung will decrease because the volume of airways will decrease in the collapsed lung.
E. The pressure in the right pleural cavity will be atmospheric at FRC.

51. Which of the following measurements is the most simple and appropriate test to diagnose chronic obstructive lung disease?

A. airway resistance
B. the FEV_1/FVC ratio
C. arterial blood gases
D. lung compliance
E. diffusion capacity

QUESTIONS 52-53.

A 60 year old man is admitted to the hospital. He is a heavy smoker for many years. He has been coughing for 15 years and has complained of shortness of breath for 10 years. On the day of admission an X-ray revealed a large lesion, diagnosed as massive atelectasis of the left lung. The diagnosis of lung cancer completely obstructing a main bronchus was made. He is moderately short of breath, but does not seem to be in acute discomfort. Arterial blood gases are obtained and they show:

PaO_2	=	50 mmHg
$PaCO_2$	=	68 mmHg
pH	=	7.36
HCO_3	=	37 mEq/L
Hb	=	18.5 g/dL
O_2 Saturation	=	85%

52. Select the **FALSE** statement:

A. The polycythemia is secondary to chronic hypoxia.
B. The patient has chronic bronchitis.
C. The patient has acute respiratory acidosis.
D. The patient is hypoventilating.
E. The patient has a significant shunt in the left lung.

A left pneumonectomy was performed. On the second postoperative day, while breathing with a respirator, his blood gases were:

PaO_2	=	145 mmHg
$PaCO_2$	=	50 mmHg
pH	=	7.47
HCO_3	=	35 mEq/L

53. Select the **FALSE** statement:

A. The patient is receiving O_2.
B. The patient is being hyperventilated.
C. It is unlikely that this patient can maintain a $PaCO_2$ of 50 mmHg off the respirator.
D. Increasing the inspired O_2 to 40% would greatly increase the O_2 content.
E. The respirator should be adjusted to reduce ventilation.

QUESTIONS 54-55.

A 25 year old black female is admitted for dry cough, weakness and shortness of breath. The X-ray of the chest reveals widespread infiltrates suggestive of diffuse interstitial fibrosis.

54. Select the **FALSE** statement:

A. Diffusing capacity will be reduced.
B. The FEV_1/FVC ratio will be normal.
C. All lung volumes will be proportionally reduced.
D. Respiratory rate will be rapid and the breathing shallow.
E. Expiration time will be prolonged.

55. The arterial blood gases of the patient are:

PaO_2	=	50 mmHg
$PaCO_2$	=	25 mmHg
pH	=	7.46
HCO_3	=	17 mEq/L

Select the **FALSE** statement:

A. The blood gases show considerable compensation.
B. This patient is hyperventilating.
C. There is probably a combination of diffusion barrier and V_A/Q imbalance.
D. The patient has acute respiratory alkalosis.
E. The patient's increased ventilatory drive is due to hypoxia.

56. In a normal subject, the arterial O_2 content will be the highest under which of the following conditions?

	Alveolar Ventilation (L/min)	Blood Hemoglobin (g/dL)	PO_2 of Inspired Air (mm Hg)
A.	6	17	300
B.	6	20	100
C.	3	8	95
D.	3	15	300
E.	6	15	95

57. Which of the following will **NOT** shift the O_2 dissociation curve to the left?

A. decreased H^+ concentration in the blood
B. decreased arterial PCO_2
C. decreased 2,3 DPG concentration in the red blood cells
D. decreased temperature
E. decreased pH in the blood

58. A well trained, healthy mountain climber is breathing air at high altitude at an atmospheric pressure of 447 mmHg. The subject is hyperventilating and the $PaCO_2$ is 20 mmHg. (Assume Hb is 15 g/dL) Select the **FALSE** statement.

A. Inspired O_2 pressure is about 85 mmHg.
B. Arterial O_2 tension is about 50 mmHg.
C. Alveolar O_2 tension is about 60 mmHg.
D. Arterial O_2 content is about 20 ml/dL.
E. Without hyperventilation the PaO_2 would be less than 50 mmHg.

For questions 59-62 identify the appropriate volume (A-E) from the definitions given.

A. Expiratory Reserve Volume (ERV)
B. Pulmonary Capillary Blood Volume (Vc)
C. Forced Expiratory Volume at 1 second (FEV_1)
D. Functional Residual Capacity (FRC)
E. Total Lung Capacity (TLC)

59. The resting lung volume at a pleural pressure of -5 cm H_2O.
60. The volume of an isolated lung at recoil pressure of 30 cm H_2O.
61. Equal to the ventricular stroke volume at rest.
62. Gives the residual volume when subtracted from FRC.

63. Which of the following will **NOT** cause hypoxemia (decreased arterial PO_2)?

A. alveolar-capillary block
B. venous admixture
C. increased O_2 consumption
D. V_A/Q imbalance
E. hypoventilation

64. Select the **FALSE** statement regarding regional ventilation in the lung.

A. It is lowest at the top of the lung.
B. It is influenced by body position.
C It shows a lesser gradient from top to bottom than perfusion.
D. It is affected by the forces of gravity.
E. The pleural pressure is less negative at the top than at the bottom of the lung.

65. Ventilation will increase most if a person is breathing a mixture of N_2 with:

A. 5.6% CO_2 and 21% O_2
B. 3.2% CO_2 and 21% O_2
C. 7% CO_2 and 10% O_2
D. 7% CO_2 and 21% O_2
E. 0% CO_2 and 15% O_2

QUESTIONS 66-67.

A.Z. a 45 year old patient with no lung disease is hospitalized with signs of hypoxemia due to left heart failure. The lungs are congested, i.e. the lung vessels are engorged and some alveoli are filled with transudate (fluids from the vasculature).

66. Select the **FALSE** statement.

A. The fluid in the alveoli will interfere with diffusion.
B. Gas exchange for CO_2 will not be significantly affected.
C. Any hypoxemia is due to hypoventilation.
D. The PaO_2 will be decreased because of a V_A/Q imblance or a shunt.
E. The lung will be stiffer because of the vascular engorgement.

67. The patient's arterial blood gases show:

PaO_2	=	60 mmHg
$PaCO_2$	=	35 mmHg
pH	=	7.45
HCO_3	=	24 mEq/L

After 10 minutes of breathing 100% O_2 the PaO_2 = 313 mmHg

Select the **FALSE** statement.

A. After the cardiac problem is corrected, this patient's lung condition will be normal.
B. The normal bicarbonate indicates that this is an acute condition.
C. This is a case of shunting.
D. If it would be only V_A/Q imbalance, the 100% O_2 would have increased higher than 313 mmHg.
E. These arterial blood gases indicate acute respiratory acidosis due to hyperventilation.

68. Select the **FALSE** statement.

A. Maximal expiratory flow (MEF) is a function of lung volume.
B. At total lung capacity (TLC) both the lung and the thorax are pulling inward.
C. Resting quiet expiration is a passive braked process.
D. At residual volume both the lung and the thorax vector are outward.
E. The resting volume of the thorax is above FRC by approximately 500 mL.

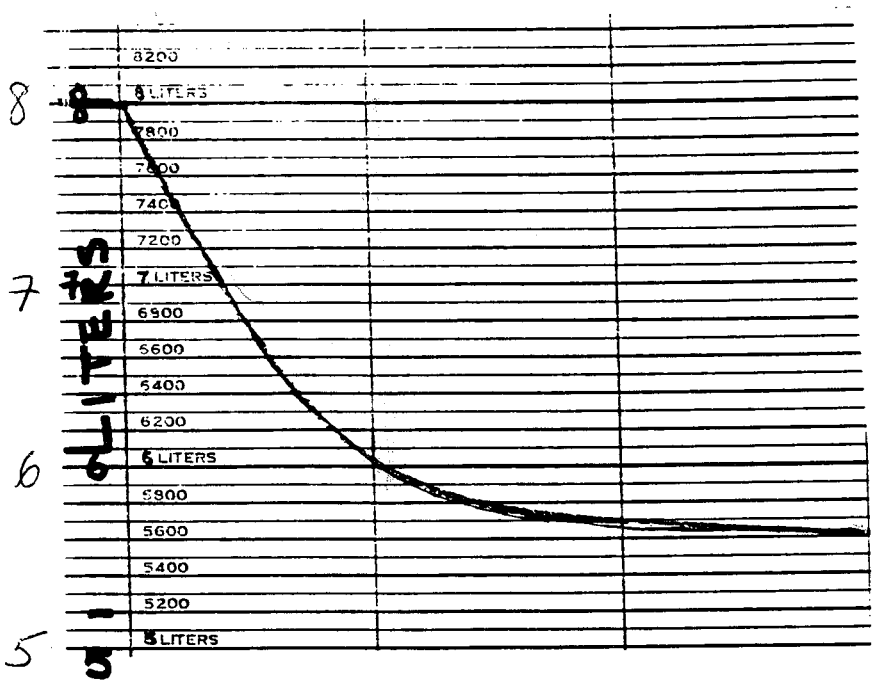
69. Select the **FALSE** statement.

A. Pleural pressure is more negative at the top of the lung at rest.
B. During forced expiration pleural pressure must be positive.
C. At FRC, in absence of flow, alveolar pressure equals ambient pressure.
D. A positive (collapsing) transmural pressure is required for the formation of the choke point.
E. During inspiration alveolar pressure is above ambient pressure.

Questions 70-71 refer to the following case:

A 30 year old BF, 68" high, is admitted because of fatigue, S.O.B. There are no significant physical findings. Diffuse lung infiltrates are seen on the X-ray.

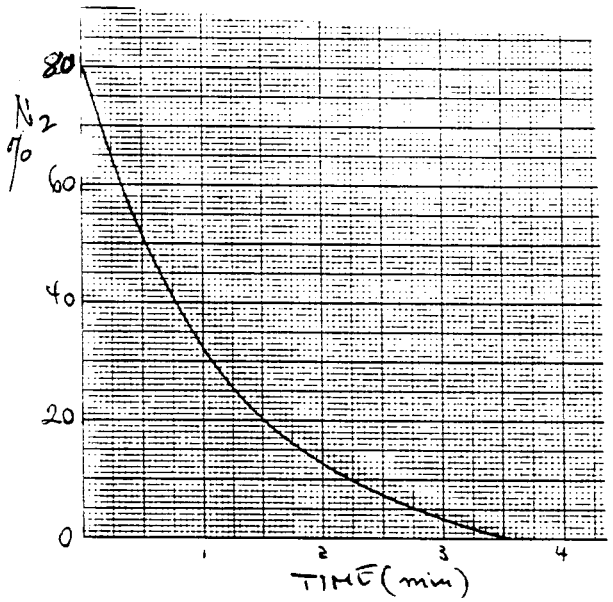
The following spirogram shows her forced vital capacity test:

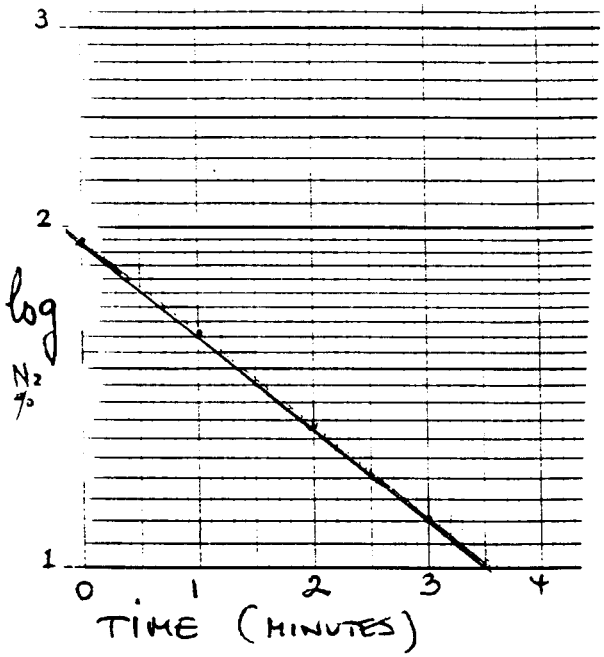


70. Using the above diagram, select the **FALSE** statement:

A. FVC is = 2.4 Liters
B. FEV_1 is = 2 Liters
C. FEV_1/FVC is = 83%
D. RV is = 1.5 Liters
E. To compare her lung volumes to those of the normal population, they should be corrected to BTPS.

71. The patient's N_2 washout curve is shown below:





At the end of the study the volume of collected air is 100 Liters and the N_2 concentration is 2%.

Using the above diagrams, select the **FALSE** statement:

A. The patient's lung is a homogeneous unit.
B. The FRC is 2.5 Liters.
C. The TLC is 4.9 Liters.
D. In order to calculate the RV, the ERV has to be known.
E. In order to perform the N_2 washout, she needs to breathe 100% O_2.

3-7-94

HUMAN PHYSIOLOGY

ANSWER KEY
EXAM #2
MARCH 7, 1994

1. C
2. E
3. A
4. C
5. D
6. E
7. C
8. D
9. D
10. C
11. E
12. B
13. E
14. C
15. A
16. C
17. D
18. C
19. B
20. B
21. B
22. E
23. C
24. C
25. E
26. C
27. B
28. A
29. D
30. C
31. D
32. B
33. A
34. B
35. B
36. D
37. OMITTED
38. B
39. E
40. D
41. D
42. E
43. B
44. B
45. E
46. D
47. B
48. A
49. D
50. E
51. B
52. C
53. D
54. E
55. D
56. OMITTED
57. E
58. D
59. D
60. E
61. B
62. A
63. C
64. E
65. C
66. C
67. E
68. D
69. D or E
70. D
71. C