Question 1  Multiple Choice
Question:  1. Most regulatory control systems utilize:
   a) Feed forward control
   b) positive feedback regulation
   c) inhibitory feedforward control
   d) a stationary set point
   e) nested regulatory loops

Question 2   Multiple Choice
Question:  2. Coughing would be eliminated in a patient with a spinal transection at the level of:
   a) T1
   b) C4
   c) T6
   d) C1
   e) all of the above

Question 3   Multiple Choice
Question:  3. The frequency of breathing would be increased by:
   a) activation of PSRs (pulmonary stretch receptors) during expiration
   b) damage to the pontine respiratory group
   c) cuffing of the vagus nerve
   d) activation of the peripheral chemoreceptors

Question 4   Multiple Choice
Question:  4. An inability to utilize the accessory muscles of respiration would be likely after:
   a) damage to the eleventh cranial nerve
   b) loss of function of nerves from C1-C4
   c) transection of the cord at C4
   d) both A and B above
   e) both B and C above

Question 5   Multiple Choice
Question:  5. The peripheral chemoreceptors sense:
   a) the acidity of the arterial blood
   b) the partial pressure of carbon dioxide in the venous blood
   c) the carrying capacity of the blood for oxygen
   d) the content of oxygen in arterial blood
   e) blood flow through the external carotid
Respiratory Control Quiz 2001

Question 6  Multiple Choice (1.0000 points)
Question: 6. Carotid body activity might be increased by all of the following conditions EXCEPT:
   a) visiting at high altitude
   b) metabolic acidosis
   c) reduced cardiac output
   d) carbon monoxide poisoning
   e) obstruction of the artery supplying the carotid body

Question 7  Multiple Choice (1.0000 points)
Question: 7. Apneusis results from:
   a) damage of the nucleus parabrachialis medialis (NPBM)
   b) loss of pulmonary stretch receptor input
   c) a pontomedullary transection
   d) both A and B above
   e) both B and C above

Question 8  Multiple Choice (1.0000 points)
Question: 8. All of the following increase during exercise EXCEPT:
   a) the size of lung zone I
   b) respiratory frequency
   c) the amount of elastic work
   d) the anatomic dead space
   e) the number of perfused alveolar capillaries

Question 9  Multiple Choice (1.0000 points)
Question: 9. The neonatal response to hypoxia is biphasic because:
   a) the peripheral chemoreceptor response is strong
   b) the neonatal brainstem is resistant to hypercapnic depression
   c) hypocapnia excites the respiratory controller
   d) the respiratory muscles fail
   e) the respiratory controller activity is decreased by hypoxia

Question 10  Multiple Choice (1.0000 points)
Question: 10. At birth, the most important drive to stimulate breathing is related to:
   a) hypoxia
   b) hypercapnia
   c) cooling
   d) central hypoxic depression
   e) laryngeal afferents
RESPIRATORY CONTROL QUIZ
June 16, 1999

Select the SINGLE, BEST answer and mark it on your bubble sheet. Be sure to bubble in your name!!!

1. The peripheral chemoreceptors would produce the greatest increase in ventilation in response to:
   a) Breathing 10% oxygen.
   b) Anemia which decreased the hematocrit to 30.
   c) Moderate poisoning with carbon monoxide.
   d) A \( P_{a}O_2 \) of 70 mmHg.
   e) A 0.2 unit increase in pH.

2. A patient suffering from a drug overdose is likely to be dependent upon the respiratory drive originating from her:
   a) peripheral chemoreceptors.
   b) J receptors
   c) pulmonary stretch receptors.
   d) central chemoreceptors.
   e) pulmonary chemoreceptors.

3. Minute ventilation during exercise is increased.
   a) almost entirely by tachypnea.
   b) almost entirely by increasing the tidal volume.
   c) by recruiting expiratory muscles.
   d) mostly due to enhanced carotid chemoreceptor activity.
   e) mostly by increased central chemoreceptor activity.

4. The increase in ventilation produced by arterial hypoxemia is limited by:
   a) increased central chemoreceptor activity
   b) central hypoxic depression
   c) Cheyne-Stokes breathing
   d) positive feedback systems
   e) the increase in \( PaCO_2 \)

5. Which of the following descriptions of respiratory control mechanisms is **TRUE**?
   a) The control of breathing is normally considered an autonomic function.
   b) The pattern of breathing is carefully controlled by several different feedback systems.
   c) Most of the respiratory "effectors" are controlled local reflex mechanisms.
   d) The respiratory rhythm generator is located within the cortex.
   e) The dorsal respiratory group contains mostly motor neurons for cranial nerves.
6. Brainstem areas which are normally involved in the control of respiration include:
   a) vINTS (ventrolateral nucleus of the tractus solitarius)
   b) NA (nucleus ambiguus)
   c) NRA (nucleus retroambigualis)
   d) PRG (pontine respiratory group)
   e) All of the above

7. The main excitatory drive for breathing at rest in the adult is:
   a) joint receptor activity
   b) peripheral chemoreceptor input
   c) cooling
   d) central chemoreceptor activity
   e) hormonal

8. The main excitatory drive for breathing in the neonate is:
   a) joint receptor activity
   b) peripheral chemoreceptor input
   c) cooling
   d) central chemoreceptor activity
   e) hormonal

9. The central chemoreceptors are likely to be located:
   a) in the DRG (dorsal respiratory group)
   b) in the VRG (ventral respiratory group)
   c) in the PRG (pontine respiratory group)
   d) near the ventral medullary surface
   e) in the cerebellum

10. To increase buoyancy when floating in a pool (after the physiology course has been completed),
    a physiology professor intentionally adopts a breathing pattern that elevates his end-expiratory volume above his normal FRC. Maintaining this elevated lung volume will tend to:
    a) increase the PSR (pulmonary stretch receptor) activity during inspiration thereby lengthening inspiratory duration,
    b) decrease the PSR activity during inspiration and lengthen inspiratory duration.
    c) increase the PSR activity during inspiration and shorten expiratory duration.
    d) increase the PSR activity during expiration and lengthen expiratory duration.
    e) increase the PSR activity during expiration and shorten expiratory duration.
1. Dream sleep (REM) occurs more in the second half of the night.
2. Obstructive sleep apnea is associated with the loss of the deeper stages of sleep.
3. Heart rate, respiratory rate, and blood pressure are decreased during REM sleep compared to NREM sleep.
4. Symptoms of snoring are usually decreased after drinking an alcoholic beverage.
5. Respiratory control is autonomic.
6. The descending pathways to the phrenic motor nucleus are spared in a C6 spinal cord lesion.
7. A quadriplegic patient will be unable to cough.
8. The peripheral chemoreceptor discharge is increased by acidosis.
9. The pulmonary stretch receptors are rapidly adapting.
10. Apneusis is associated with lesions of the medulla.

11. REM sleep is synonymous with all of the following EXCEPT:
   a) dream sleep
   b) active sleep
   c) paradoxical sleep
   d) stage 2 sleep

12. Nicotine replacement patches can increase the incidence of nightmares through an action on:
   a) the catecholaminergic pathways affecting sleep.
   b) cholinergic receptors in the brain.
   c) glutamatergic receptors in the brain.
   d) narcolepsy.

13. After removal of the peripheral chemoreceptors, the length of apneic periods in a patient with obstructive sleep apnea would be expected to:
   a) increase
   b) stay the same
   c) decrease

14. All of the following are characteristics of narcolepsy EXCEPT:
   a) cataplexy
   b) sleep paralysis
   c) obstructive sleep apnea
   d) excessive daytime somnolence
   e) hypnogogic hallucinations

15. The strongest stimulus to increase carotid body discharge would be:
   a) a PaO2 of 80 mmHg
   b) a PaCO2 of 30 mmHg
   c) a blood pH of 7.25
   d) breathing 15% oxygen
   e) a PaO2 of 70 mmHg, a PaCO2 of 35 mm Hg and a pH of 7.4
Respiratory Control 1997

The 10 questions on this quiz are to be completed within 30 minutes without the use of any assistance. It should not be discussed with other students until all have completed the exam.

1. I understand that these quizzes and exams are governed by the Professional Code (for medical students) and the Honor Code (for dental students). I understand that the instructions given above must be taken seriously and I agree to complete this test within the next 30 minutes without any assistance of any kind - just me and my newfound knowledge!
   a) I agree (you get one point)
   b) I disagree (you missed this question - please review your professional codes)

2. A patient with a spinal cord lesion at T3 (the third thoracic vertebra) would have the greatest difficulty in:
   a) swallowing
   b) vomiting
   c) recruiting his accessory muscles
   d) inspiring to 2 liters above FRC
   e) drinking through a straw

3. The respiratory pump muscles are excited by:
   a) norepinephrine
   b) acetylcholine
   c) the sympathetic nervous system
   d) the parasympathetic nervous system

4. The laryngeal resistance would be greatest during:
   a) exercise
   b) deep, slow breathing
   c) early inspiration
   d) expiration

5. A patient presents with a PaO2 = 50 mmHg and a PaCO2 = 45 mmHg. You place him on 100% inspired oxygen and his PaO2 increases to 75 mmHg. Under these circumstances you would expect his ventilation to ___________ and his PaCO2 to ___________
   a) Increase; increase
   b) increase; decrease
   c) decrease; increase
6. To increase buoyancy when floating in a pool (after the physiology course has been completed), a physiology professor intentionally adopts a breathing pattern that elevates his expiratory volume above his normal FRC. Maintaining this elevated lung volume will tend to:
   a) increase the PSR (pulmonary stretch receptor) activity during inspiration thereby lengthening inspiratory duration.
   b) decrease the PSR activity during inspiration and lengthen inspiratory duration.
   c) increase the PSR activity during inspiration and shorten expiratory duration.
   d) increase the PSR activity during expiration and lengthen expiratory duration.
   e) increase the PSR activity during expiration and shorten expiratory duration.

7. The respiratory rhythm is known to be generated by:
   a) pacemaker neurons
   b) network interactions
   c) neurons in the brainstem
   d) brain cortex

8. The peripheral chemoreceptors increase their activity in response to:
   a) decreased PaCO2
   b) increased PaO2
   c) increased barometric pressure
   d) decreased oxygen carrying capacity of the blood
   e) rebreathing from a closed container

9. The central chemoreceptors are located:
   a) in the carotid artery
   b) near the ventral medullary surface
   c) in the central lung region
   d) in the pontine respiratory group
   e) in the dorsal respiratory group

10. Narcotics decrease the:
    a) central chemoreceptor response to CO2
    b) peripheral chemoreceptor response to CO2
    c) central chemoreceptor response to oxygen
    d) peripheral chemoreceptor response to oxygen
    e) central and peripheral chemoreceptor responses to ventilation.
1. All the following statements concerning the structure of the lungs are correct except
   a) Physiologic dead space is the volume in the lung that does not participate gas exchange.
   b) Physiological dead space = (anatomic dead space) + (alveolar dead space)
   c) The total number of alveoli in the lung of an adult is 300-400 millions.
   d) The total number of alveoli in the lung of a newborn infant is the same as that in the lung of an adult.

2. The functional residual capacity is measured in a patient with chronic obstructive lung disease using both the helium dilution method and the body plethysmograph method. If his lungs are poorly ventilated because of massive airway obstructions, which method will likely yield a lower value for the functional residual capacity measurement in this patient?
   a) Helium dilution method
   b) Body plethysmograph method
   c) No difference between the values obtained from these two methods.

3. A healthy individual breathes room air in a resting condition. His tidal volume (V_T) is 0.8 liters, and his respiratory rate (f) is 10 breaths per minute. If his physiologic dead space (V_D) is 0.3 liters, his alveolar ventilation (V_A) is:
   a) 4.0 liters/min
   b) 5.0 liters/min
   c) 6.0 liters/min
   d) 8.0 liters/min

4. In a young healthy individual, the ratio of FEV_{1.0} / FVC is approximately:
   a) 40%
   b) 60%
   c) 80%
   d) 100%

5. The lung compliance of a patient with restrictive lung disease (e.g., pulmonary fibrosis) is likely to be ________________ that of the healthy individuals of same body weight, height and age.
   a) greater than
   b) the same as
   c) smaller than
1. The volume of air that remains in the lung at the end of a maximal expiration is:
   a) expiratory reserve volume.
   b) vital capacity.
   c) residual volume.
   d) functional residual capacity.

2. The ratio between the total cross-sectional area of the airways in the major bronchi (1st generation) and the respiratory bronchioles (17th generation) is approximately:
   a) 100:1
   b) 10:1
   c) 1:1
   d) 1:100

3. The functional residual capacity (FRC) of a patient with chronic obstructive pulmonary disease (COPD) is measured by both helium dilution method and body plethysmography method. Which of these two measurements is likely to show a larger value of FRC in this patient?
   a) Helium dilution method
   b) Body plethysmography method
   c) No difference between the two is expected.

4. Which of the following muscles is an inspiratory muscles?
   a) rectus abdominus
   b) internal intercostal muscle
   c) sternocleidomastoid muscle

5. A premature newborn infant has been diagnosed with infant respiratory distress syndrome (or surfactant deficiency syndrome), and immediately exogenous surfactant is administered into his lung via an endotracheal tube to alleviate the stress. After the administration of surfactant, the slope of the pressure-volume curve of his lung is expected to:
   a) increase.
   b) decrease.
   c) remain unchanged.
1. The maximal amount of air that can be exhaled from the lung following a maximal inspiration is:
   a) expiratory reserve volume.
   b) vital capacity.
   c) total lung capacity.

2. The volume of functional residual capacity (FRC) measured in a patient with chronic obstructive lung disease by the helium dilution method is likely to be________________that measured by the body plethysmograph method.
   a) greater than
   b) the same as
   c) smaller than

3. The total number of alveoli in the lung of a 10-year old child is _____________ that in the lung of an adult.
   a) greater than
   b) the same as
   c) smaller than

4. In a measurement of functional residual capacity by the helium dilution method, the initial and final concentrations of helium are 7% and 4%, respectively. The initial volume of helium gas mixture in the spirometer is 4 liters. What is the volume of functional residual capacity in this individual?
   a) 3 liters
   b) 4 liters
   c) 7 liters

5. A healthy individual breathes room air in a resting condition. He hyperventilates for five minutes, and his alveolar ventilation is doubled. His alveolar partial pressure of CO₂ will:
   a) be halved.
   b) remain unchanged.
   c) be doubled.
Quiz / PGY 818 / Respiration / May 29, 1997

1. The volume of air remaining in the lung after a maximal expiration is:
   a) vital capacity
   b) functional residual capacity
   c) residual volume

2. The total number of alveoli in the lung of a newborn infant is ______________that in the lung of an adult.
   a) greater than
   b) the same as
   c) smaller than

3. A healthy individual breathes room air in a resting condition. His tidal volume ($V_T$) is 0.6 liters, and his respiratory rate (f) is 10 breaths per minute. If his physiologic dead space ($V_D$) is 0.2 liters, his alveolar ventilation is
   a) 4.0 liters/min
   b) 5.0 liters/min
   c) 6.0 liters/min

4. Which of the following endogenous chemical substances causes smooth muscle relaxation in the respiratory tract?
   a) acetylcholine
   b) histamine
   c) epinephrine

5. The lung compliance of a patient with restrictive lung disease (e.g., pulmonary fibrosis) is likely to be ______________ that of the healthy individuals of same body weight, height and age.
   a) greater than
   b) the same as
   c) smaller than