1. The photo below is of the open thorax of a newborn who remained hypoxic despite vigorous attempts at ventilation.

![Image of open thorax of a newborn]

All of the following are possible scenarios for this case except: (3 points)

A. Renal agenesis
B. Bladder outlet obstruction
C. Laryngeal atresia
D. Prolonged premature rupture of membranes
E. Small chest cavity during fetal life secondary to multiple rib fractures in osteogenesis imperfecta

Answer: C

2. You are seeing a young previously healthy patient in the Emergency room with an acute asthma attack. She looks very uncomfortable, she has diffuse wheezing throughout all lung fields and is requiring 50% oxygen by face mask to maintain oxygen saturations above 90%. A nurse reports that when the patient blows in her peak flow meter it reads in the normal range. What should you do next:

A. send the patient home. She is better
B. repeat the peak flow several more times
C. ignore the results and treat for severe asthma
D. get another peak flow meter.

Answer: C
3. Which of the following does not cause airway narrowing in an asthma attack:

A. destruction of airways  
B. mucus hypersecretion  
C. airway edema  
D. bronchospasm

Answer: A

4. All of the following statements about β-adrenergic agonists used to treat asthma are correct EXCEPT:

A. Inhaled β-agonists used in clinical practice are selective for β receptors at usual doses, but become less selective at escalating doses  
B. Inhaled β-agonists are functional antagonists of constriction and result in relaxation of the airway smooth muscle regardless of mechanism of constriction  
C. Repeated exposure to inhaled β-agonists results in up-regulation of the β receptors which allows for decreased doses over time  
D. Long acting β-agonists are not used for acute symptoms and are not intended as first-line therapy for worsening asthma  
E. Long acting β-agonists are effective in controlling night-time symptoms and exercise-induced symptoms

Answer: C

5. Choose the BEST answer:

Transmission of tuberculosis occurs:

A. ONLY in household contacts of a person with active tuberculosis disease (source case)  
B. BY sharing household utensils, contact with secretions and or blood products of an patient sick with tuberculosis disease  
C. By sharing an airspace with an adolescent or adult who has smear positive pulmonary tuberculosis disease  
D. Prolonged contact with an individual with LTBI

Answer: C

6. The anti-tubercular activity of isoniazid (INH) involves inhibition of:
A. Mycolic acid synthesis
B. Folic acid synthesis
C. ATP formation
D. RNA polymerase
E. DNA topoisomerase

Answer: A

7. Which of the following is true regarding sleep disordered breathing?

A. An arousal from sleep is associated with a shift in EEG frequency and a full awakening from sleep.
B. One of the major causes of excessive daytime sleepiness in Obstructive Sleep Apnea Syndrome is sleep fragmentation due to repeated arousals from sleep.
C. Central Sleep Apnea and Cheyne Stokes Respiration are not associated with EEG arousals from sleep or sleep fragmentation.
D. An Obstructive Apnea is a respiratory event lasting at least 10 seconds and associated with cessation of airflow and ongoing respiratory effort.
E. b and d

Answer: E

8. Which of the following statements is/are true regarding chemoreceptors:

A. The central chemoreceptor are mainly responsible for hypercarbic respiratory drive
B. The peripheral chemoreceptors are responsible for hypoxic respiratory drive
C. Vagal receptors in the lung may be responsible for some instances of hyperventilation
D. A and B
E. All of the above

Answer: E

9. Hypoventilation due to brainstem pathology can be separated from hypoventilation due to peripheral neuropathy or myopathy by determining the A-a gradient while the patient breathes room air

A. True
B. False
10. One of your “crazy” medical school professors decides to participate in a research climb of Mount Everest. At the summit, an elevation of roughly 29,000 feet, she decides to see how difficult it is to breathe while standing still without using her oxygen mask. The atmospheric pressure is measured at 253 mm Hg. Her end-tidal CO₂ level is measured at 8 mm Hg – this is equivalent to her alveolar PACO₂. What is her alveolar PO₂?

A. 196  
B. 53  
C. 33  
D. 10

Answer: C

11. COPD differs from asthma in the following respects:

A. It is characterized by partial reversibility of obstruction at best  
B. Airway inflammation with many eosinophils renders COPD highly responsive to inhaled steroids  
C. COPD, unlike asthma, is largely preventable  
D. All of the above  
E. A and C

Answer: E

12. Mr. Smith has about 2 asthmatic episodes per month. His PFTs show an FEV1 of 85% of predicted. You prescribe:

A. Allergen avoidance alone  
B. Allergen avoidance and “as needed” use of albuterol inhalers  
C. Albuterol inhaler daily with an inhaled corticosteroid  
D. A 10-day course of oral steroids followed by daily albuterol

Answer: B

13. Which of the following is not a mechanism of action of omalizumab?

A. Blocks the site on IgE where it binds to the high affinity IgE receptor on
14. A pre-op patient is given 4 units of fresh frozen plasma (volume = 200 cc each) rapidly, to correct a slight elevation in a routine coagulation test, immediately before surgery. During the last infusion, the patient suddenly develops severe shortness of breath. A stat chest x-ray shows a bilateral, diffuse infiltrate. Arterial blood gases reveal a PaO² of 50 on room air, and a Swan-Ganz catheter is placed, measuring the pulmonary capillary pressure as normal. There is no history of cardiac disease, and the now cancelled surgery was for a routine gallbladder resection. What is the likely diagnosis? (2 points)

A) Congestive heart failure
B) Volume overload
C) Transfusion related acute lung injury
D) Sepsis from an infected unit of fresh frozen plasma

Answer: C

15. Indicate which of the following statements about mast cell stabilizers is CORRECT:

A. Effective after a single dose in decreasing bronchial inflammation of chronic asthma
B. Highly effective rescue medicine when used during acute bronchospasm
C. NHLBI (National Heart, Lung and Blood Institute) National Asthma Education Program consensus guidelines recommend mast cell stabilizers as the preferred treatment for persistent asthma
D. Effective option in prophylaxis of mild to moderate persistent asthma and exercise-induced asthma
E. Use is limited due to frequent adverse effects, with >10% of patients reporting dysphonia (difficulty or pain in speaking), thrush and headache

Answer: D
16. Which of the following best describes the pathophysiologic mechanisms seen in Obstructive Sleep Apnea?

A. A narrowed airway and increased upper airway muscle tone during sleep lead to upper airway collapse, hypoxia, and hypercapnia.
B. During an obstructive apnea or hypopnea, there is upper airway collapse without increased respiratory effort, leading to hypoxia and hypercapnia.
C. At the termination of an obstructive apnea, there is an arousal from sleep which leads to pharyngeal muscle tone being restored and opening of the airway.
D. a and b
E. b and c

Answer: C

17. Tuberculosis transmission is a problem among infants in many orphanages in the developing world. The MOST EFFECTIVE way to reduce transmission of tuberculosis within an orphanage in a highly tuberculosis endemic area would be:

A. To perform a tuberculin skin test (PPD) on all infants upon entry to the orphanage
B. To Isolate all infants with fevers
C. To Require tuberculosis screening, diagnosis and treatment of ALL staff members who work in the orphanages

Answer: C

18. All of the following statements about the role of theophylline in asthma management are correct EXCEPT:

A. Narrow therapeutic window requiring serum drug level monitoring and has multiple drug interactions
B. Side effects like insomnia, agitation, nausea, loose stools and tachycardia limit tolerability
C. Results in bronchodilation by enhancing the activity of endogenous β adrenergic agonists
D. Results in anti-inflammatory activity by antagonizing adenosine mediated proinflammatory activity
E. Is used as a rescue medicine for patients taking MAO (monoamine oxidase) inhibitors who can not receive β -adrenergic agonists
19. All of the following can be seen with aspergillus infection except:
(Hint: the correct answer is a description of the pathology typical of infection by another specific agent.)

A) Asymptomatic lung mass picked up on routine chest x-ray
B) Intra-alveolar frothy exudate containing yeast forms
C) Invasion of blood vessels leading to multiple pulmonary infarcts and hemorrhages
D) Fulminant pneumonia in an immunocompromised patient

Answer: B

20. All of the following medication categories are asthma “controller” medications, which affect the underlying causes of the disease, EXCEPT:

A. Inhaled corticosteroids
B. Inhaled muscarinic receptor antagonists
C. Leukotriene receptor antagonists
D. Mast cell stabilizers

Answer: B

21. J.W. is a 35-year-old female patient who is going to be treated for active tuberculosis. J.W. wears soft contact lenses. Before starting treatment, you advise her to stop wearing the soft lenses because they may get a red-orange discoloration. This discoloration (as well as a similar discoloration of her urine) occurs because you will be administering:

A. Isoniazid (INH)
B. Pyrazinamide
C. Ethambutol
D. Amikacin
E. Rifampin

Answer: E

22. All of the following regarding ventilation-perfusion relationships are true except:
A. Regions of the lung with reduced ventilation relative to perfusion will contribute to arterial hypoxia
B. In the upright patient, the lung apex may have areas of very high ventilation relative to perfusion
C. The lung bases tend to be ventilated to a greater extent than the apices
D. Dead space ventilation is a cause of hypoxemia
E. In a zero gravity environment, we might expect the Aa gradient to decrease

Answer: D

23. All of the following statements about the role of inhaled corticosteroids in the management of asthma are correct EXCEPT:

A. Due to the frequent side effects of inhaled corticosteroids (thrush, Cushingoid changes, growth retardation in children, acute adrenal insufficiency, etc.) their role is limited to prophylaxis of severe persistent asthma
B. Inhaled corticosteroids are not effective in the relief of acute bronchospasm
C. Long-term corticosteroid use results in the upregulation of β-receptors enhancing responsiveness to inhaled β-agonists
D. Corticosteroids inhibit the release of leukotrienes and decrease IgE synthesis to decrease airway inflammation
E. Inhaled corticosteroids can be combined with long acting β-agonists to suppress airway inflammation and hyper-reactivity in moderate to severe persistent asthma

Answer: A

24. A 23 year old female has massive aspiration of gastric contents after being admitted comatose following a drug overdose. She is intubated and an arterial blood gas is obtained with results: FiO2 100%, pH 7.30 PaCO2 30 PaO2 40. Her chest xray is most likely to show the following findings:

A. Clear lungs with hyperinflation
B. Pleural effusion on the right side
C. Bilateral alveolar infiltrates
D. Clear lungs without hyperinflation

Answer: C
25. A Swan-Ganz catheter is inserted and pulmonary capillary wedge pressure is found to be 12 cm H\(_2\)O (normal 8-14 cm H\(_2\)O). The most likely cause of her hypoxemia is:

a. R to L shunting due to acute cardiogenic pulmonary edema  
b. V/Q mismatch due to bronchospasm  
c. R to L shunting due to Acute Lung Injury  
d. Increased dead space due to microvascular occlusion

Answer: C

26. The patient is placed on a mechanical ventilator with Tidal Volume 1500cc and FIO\(_2\) 50%, PEEP 12. An ABG shows pH 7.45 PaO\(_2\) 110 PaCO\(_2\) 25. Your next order is which of the following:

a. Increase PEEP to 15 to improve A-a gradient  
b. Give a blood transfusion to improve oxygen transport  
c. Increase FIO\(_2\) to improve oxygen transport  
d. Decrease Tidal Volume to reduce volutrauma

Answer: D

27. Indicate which of the following asthma medications exerts its activity by inhibiting 5-lipoxygenase to prevent the synthesis of leukotrienes from arachidonic acid.

A. Zafirlukast  
B. Montelukast  
C. Zileuton  
D. Cromolyn  
E. Omalizumab

Answer: C

28. Latent (or inactive) tuberculosis can occur in an individual who has been in close contact with someone who has active tuberculosis. Because the number of bacteria is much less in latent tuberculosis compared to the active form, single drug therapy can be used. The most common drug used for treatment of latent tuberculosis is isoniazid (INH). However, INH can produce paresthesia (burning or tingling in feet and hands). This side effect can be prevented by concurrent treatment with:
A. Ethionamide
B. Dapsone
C. Pyridoxine
D. Rifabutin
E. Ascorbic acid (Vitamin C)

Answer: C

29. All of the following general principles of active tuberculosis treatment are correct EXCEPT:

A. Multi-drug therapy is utilized
B. Directly observed therapy (DOT) can be part of the treatment regimen
C. Some anti-tubercular drugs can reduce the half-life of other drugs, which may necessitate increasing the dosages of the affected drugs
D. If the patient is symptom-free after 4 weeks of treatment, drug administration can be halted
E. Some patients will have resistance to more than one anti-tubercular drug

Answer: D

30. The anti-tubercular activity of rifampin involves inhibition of:

A. Folic acid transport
B. RNA polymerase
C. Electron transport
D. Cytochrome P450 enzymes
E. DNA replication

Answer: B

31. You have a bright premed working in your lab. He has sickle cell disease, and you cannot convince him not to go into pulmonary and critical care medicine. He is interested in hyperbaric therapy. He asks you to help him determine, very roughly, how many atmospheres of pressure would be required, using normal air without added oxygen, just to deliver the normal 250 ml of oxygen per minute to the tissues. For the sake of this mental challenge, he suggests you assume there is no functional hemoglobin (Hb = 0), a normal cardiac output of 5.0 liters per minute, a normal $P_aCO_2$ of 40, no Aa gradient, and no tissue oxygen extraction.

A. 3 atmospheres
B. 8 atmospheres
C. 11 atmospheres
D. 17 atmospheres

Answer: C

32. Which statement regarding shunt is most accurate?

A. The ventilation to perfusion ratio is infinite
B. Lung recruitment, using PEEP, is often employed to reduce shunting
C. The response to supplemental oxygen is usually adequate to reverse low arterial oxygen content
D. Common causes of shunt include obstructive airways diseases
E. In addition to hypoxemia, shunt often results in significant hypercarbia

Answer: B

33. Which of the following statements regarding COPD is/are correct?

A. Bilateral basilar panlobular emphysema should prompt you to consider obtaining an alpha-1-antiprotease level
B. The compliance curve of the respiratory system is shifted down and to the right in emphysema
C. The ciliary defect in chronic bronchitis is characterized by the absence of the outer dynein arm of the 9 + 2 microtubule arrangement seen on electron microscopy of bronchial biopsies
D. Smoking cessation leads to a halt in the decline in lung function over the years that follow
E. B and D

Answer: A

34. Cheyne Stokes Respiration

A. Is most commonly seen in patients with stroke
B. Represents an obstructive type of sleep disordered breathing
C. Does not correlate with the severity of heart disease/ congestive heart failure
D. Is a type of sleep disordered breathing resulting from instability of the respiratory control system
E. c and d

Answer: D
The above photo is from electron microscopy of a lung tumor. The patient is a 26 year old man who presented with cough, hemoptysis, and episodes of flushing, diarrhea, and cyanosis. Which of the following is the likely diagnosis? (2 points)

A. Squamous cell carcinoma  
B. Bronchial carcinoid  
C. Adenoid cystic carcinoma  
D. Adenocarcinoma  

Answer: B  

36. Name another tumor affecting the lung which exhibits similar granules on electron microscopy. Fill in the blank. (1 point)  

37. Fast acetylators and slow acetylators will vary significantly with regard to the half-life of which anti-tubercular drug?
A. Rifampin
B. Isoniazid (INH)
C. Aminosalicylic acid
D. Moxifloxacin
E. Pyrazinamide

Answer: B

38. D.O. is a 30-year-old female patient who is going to be treated for active tuberculosis. She is currently taking oral contraceptives. You advise her that she may have to increase the dosage of the contraceptives because of one of the drugs she will be taking to treat the tuberculosis. The most likely anti-tubercular drug responsible for this is:

A. Aminosalicylic acid
B. Amikacin
C. Rifampin
D. Iproniazid (INH)
E. Ethambutol

Answer: C

39. Induction agents, such as thiopental, produce a short period of hypnosis to allow for control of the airway. Their short duration of action is due primarily to:

A. Rapid hepatic metabolism
B. Substantial binding to plasma proteins
C. Rapid renal clearance
D. Limited penetration of the blood brain barrier
E. Rapid redistribution to other tissues allowing the brain concentration to decline

Answer: E

40. Indicate the most commonly administered anesthetic induction agent that is dissolved in a lipid emulsion for intravenous delivery:

A. Etomidate
B. Ketamine
C. Sodium thiopental
D. Methohexital
E. Propofol
Effective cough requires normal function of which of the following:

A. Vocal cords
B. Diaphragm
C. Abdominal muscles
D. A and C
E. All of the above

Answer: E

Fine crackles on exam may indicate:

A. Interstitial lung disease such as IPF
B. Pulmonary edema due to congestive heart failure
C. Airway narrowing resulting in turbulent flow
D. A and B
E. All of the above

Answer: D

Which of the following findings is not suggestive of consolidation, such as in pneumonia?

A. Dullness to percussion over the involved area of the chest
B. Egophony over the involved area of the chest
C. Bronchial breath sounds over the involved area of the chest
D. Decreased tactile fremitus over the involved area of the chest
E. They are all suggestive of consolidation

Answer: D

Inhaled anesthetic agents, such as nitrous oxide and desflurane have rapid onset and offset of action compared to halothane because of:

A. Their high potency
B. The fact that they are inhaled
C. The fact they are poorly soluble in the bloodstream
D. The fact that they have very high MAC numbers
45. Opioids, such as morphine and fentanyl, are inadequate anesthetics because they:

A. Must be administered intravenously
B. Do not inhibit movement and do not provide amnesia
C. Are respiratory depressants
D. Produce nausea and vomiting
E. Produce pruritis (itching)

Answer: B

46. Bronchiectasis may be the end result of which of the following:

A. Defective ciliary function
B. IgG deficiency
C. Sleep-disordered breathing
D. Prior severe infection
E. A, B, and D

Answer: E

47. Given the Starling equation: Fluid movement = Kf [(Pcap – Ppl) - σ (πcap - πpl)]

Where:

Kf = filtration coefficient (a function of the permeability of the pleural surface)
Pcap = hydrostatic pressure in the capillaries
Ppl = hydrostatic pressure in the pleural space (negative in the normal state)
σ = reflection coefficient (measure of the capillary’s impermeability to proteins)
πcap = colloid oncotic pressure in the capillaries
πpl = colloid oncotic pressure in the pleural space

We might expect to see a transudative pleural effusion in which of the following circumstances?

A. Increased pulmonary venous pressures
B. Significantly reduced blood albumin levels due to a chronic catabolic state
C. Elevated colloid oncotic pressure in the pleural space
D. A and B
E. All of the above

Answer: D
48. An exudative pleural effusion may be characterized by

A. Elevated pleural fluid protein levels
B. A low fluid pH
C. A high RBC count
D. A glucose level of less than 70
E. A and B

Answer: A

49. Which of the following regarding lung cancer is/are true?

A. Surgery is routinely employed in the treatment of all stages of lung cancer
B. The majority of patients present with unresectable disease at the time of their lung cancer diagnosis
C. Smoking and asbestos exposure are additive in their effect on lung cancer risk
D. Proto-oncogenes and tumor suppressor gene mutations are the most important risk factors for the development of lung cancer
E. A and C

Answer: B

50. Curare-type skeletal muscle relaxants are competitive antagonists with respect to:

A. Norepinephrine
B. Epinephrine
C. Choline
D. Acetylcholine
E. GABA

Answer: D

51. The main benefit of the benzodiazepine class with regard to usage as anesthetic induction agents:

A. They provide excellent amnesia
B. They provide excellent muscle relaxation
C. Most have a very short duration of action
D. They are excellent analgesics
E. They have a very reliable rate of elimination
52. In the photo below, the lumen of a small bronchus is indicated by an asterisk. The numerous inflammatory cells contain red-staining granules in the cytoplasm.

The arrow points to:  (2 points)

A. Hypertrophied smooth muscle
B. A thickened basement membrane
C. Bronchial cartilage

Answer:  B

53. The patient most likely has:  (2 points)

A. Cystic fibrosis
B. Chronic bronchitis
C. Bronchial asthma

Answer:  C

54. The inflammatory cells referred to above:  (2 points)
A. were attracted by IL-5 released by TH2 cells
B. are the cells which have presented the antigen to mast cells
C. are the equivalent of basophils in the peripheral blood

Answer: A

55. The bioavailability of a drug may be reduced by a first-pass effect to the greatest extent following administration by which of the following routes?

A. Transdermal
B. Sublingual
C. Subcutaneous
D. Oral
E. Inhalation

Answer: D

56, 57, 58. Use the following plasma drug concentration data to answer the next three questions:

A single 1mg dose of drug X was administered I.V. to a 70 kg male subject. The concentration of drug X in plasma is reported below.

<table>
<thead>
<tr>
<th>Time (hr)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plasma Concentration Of drug X (µg/l)</td>
<td>40</td>
<td>32</td>
<td>25</td>
<td>20</td>
<td>16</td>
</tr>
</tbody>
</table>

56. The elimination half-life of drug X in this subject is:

A. 1 hr
B. 2 hr
C. 3 hr
D. 4 hr
E. 8 hr

Answer: C

57. The apparent volume of distribution of drug X in this subject is:

A. 5L
B. 20L  
C. 50L  
D. 100L  
E. 300L

Answer: B

58. The volume of distribution of drug X suggests:

A. Drug X distributes into the extracellular fluid compartment, with possible entry into some cells  
B. Drug X distributes to an intracellular site and is largely bound to intracellular proteins.  
C. Drug X distributes into total body water and has access into the CNS  
D. Drug X completely remains in the plasma compartment

Answer: A

59. A 68 year old male cigar smoker presents with a cough productive of blood streaked sputum and weakness. His chest X-ray reveals a left sided hilar lung mass. His serum electrolytes demonstrate a low sodium (122), normal renal function, normal liver function tests, and normal serum calcium and phosphate. Which of the following is/are true?

A. Paraneoplastic syndromes are most frequently associated with squamous cell carcinoma  
B. This patient may have SIADH (syndrome of inappropriate anti-diuretic hormone)  
C. His chest film suggests he may have either adenocarcinoma or small cell carcinoma  
D. If his pulmonary function studies are good, surgery would be the next step for him  
E. A, B, and C

Answer: B

60. Drug Z is a weak organic base and has a renal clearance of 180 ml/min in a 70-kg male subject. One can conclude that the renal clearance of drug Z:

A. Approximates the renal plasma flow  
B. Indicates that drug Z is partially reabsorbed from the renal tubules  
C. May increase when another organic base is administrated at the same time  
D. May decrease when an organic acid is administrated at the same time  
E. Is likely to increase with acidification of the urine
61. In normal 70-kg subjects drug A has a half-life of 4 hours and a recommended infusion rate of 20 µg/min. In a 70-kg patient with renal failure, the volume of distribution of drug A is like that found in normal subjects, but its total clearance is only half as large. An appropriate infusion rate of drug A for this patient would be:

A. 2.5 µg/min  
B. 5 µg/min  
C. 10 µg/min  
D. 20 µg/min  
E. 40 µg/min

Answer: C

62. A patient is treated with a standard dose of a pro-drug that requires biotransformation to an active drug by the CYP2D6 isoform of cytochrome p450. This patient has two mutant alleles for CYP2D6 resulting in low activity of the enzyme. It can be expected that, compared to subjects with the wild-type gene, in this patient:

A. The dose will be less efficacious  
B. The plasma concentrations of active drug will be higher  
C. The risk of toxicity from the active drug will be greater  
D. The total clearance of the active drug will be lower  
E. The plasma elimination half-life of the active drug will be shorter

Answer: A

63. For a patient with pulmonary hypertension, which of the following is the most important cause of increased pulmonary vascular resistance:

A. Increased blood viscosity due to increased globulins  
B. Increased right atrial pressure  
C. Decreased arterial lumen diameter  
D. Decreased cardiac output

Answer: C
64. The rationale for prescribing an oral loading dose as part of an oral dosing regimen is greatest for a drug with:

A. High total clearance  
B. Small volume of distribution  
C. Low bioavailability  
D. Long elimination half-life  
E. Low therapeutic index

Answer: D

65. A patient receives a drug by continuous intravenous infusion. The drug has an elimination half-life of 1 hour. Twelve hours after the start of the infusion, the patient’s condition deteriorates abruptly, and the total clearance of the drug decreases by 30%. If the same dosing rate is maintained, it can be expected that the Cp will:

A. Remain the same  
B. Increase 30% to a new Cpss after about 1 hour  
C. Increase 30% to a new Cpss after about 4 hours  
D. Decrease 30% to a new Cpss after about 4 hours  
E. Decrease 30% to a new Cpss after about 8 hours

Answer: C

66. A 60 year old with COPD is admitted with PaO$_2$ of 40 while breathing room air, weight gain, shortness of breath, and 4+ pedal edema. The most likely cause of the edema is:

A. Left ventricular failure  
B. Low albumin due to malnutrition  
C. Right ventricular failure due to hypoxic pulmonary hypertension  
D. Increased permeability edema

Answer: C
67. A patient with higher than normal urinary pH due to chronic use of antacids takes a drug that is a weak organic base. Compared to patients with lower urinary pH, this patient is most likely to have:

A. Higher renal clearance of the drug  
B. Lower renal clearance of the drug  
C. Lower non-renal clearance of the drug  
D. Lower clearance of the drug by glomerular filtration  
E. Higher total clearance of the drug

Answer: B

68. Total Lung Capacity (TLC) is determined by (choose the best answer):

A. strength of the inspiratory muscles  
B. recoil pressure of the respiratory system at TLC  
C. recoil of the chest wall at TLC  
D. a and b  
E. a and c

Answer: D

69. Functional Residual Capacity (FRC) is determined by:

A. Expiratory Muscle Strength  
B. Recoil pressure of the chest wall at FRC  
C. Recoil pressure of the lung at FRC  
D. b and c  
E. a and c

Answer: D

70. Which of the following would be expected to increase the biotransformation of a drug oxidized by CYP3A4?
A. A genetic polymorphism that results in expression of a truncated form of the enzyme with a lower enzymatic activity
B. Concomitant administration of a competitive inhibitor of CYP3A4
C. An increase in the dose administered to the patient
D. Pretreatment with an inducer of CYP3A4

Answer: D

71. The addition of glucuronic acid to a drug:

A. Results in a product that is more lipophillic
B. Occurs at the same rate in adults and newborns
C. Involves cytochrome p450
D. Is an example of a Phase I reaction
E. Is an example of a Phase II reaction

Answer: E

72. Restrictive Lung Disease is defined as:

A. a decrease in FEV1 to less than 80% predicted
B. a decrease in vital capacity (VC) to less than 80% predicted
C. a decrease in TLC to less than 80% predicted
D. an increase in residual volume (RV) to greater than 120% predicted

Answer: C

73. The pulmonary function test that is most characteristic of Obstructive Lung Disease is:

A. a decrease in FEV1
B. a decrease in FVC
C. a decrease in FEV1 / FVC
D. a decrease in diffusion capacity (DLCO)
E. a decrease in RV

Answer: C

74. A 73 year old man with a prior smoking history complaining of gradually progressive dyspnea on exertion comes to your office. His history is significant for work as an insurance auditor prior to retirement. On your exam, you notice he has clubbing of his fingers and fine crackles over the lower quarter of both posterior lung fields. You
order a chest X-ray which shows bibasilar increased lung markings and some honeycomb pattern.

Your next steps should include:

A. Review the patient’s medical history in greater detail with respect to past occupations, hobbies, and exposures
B. A CT scan of the chest with high-resolution images
C. Starting the patient on albuterol and ipratropium for his pulmonary symptoms
D. All of the above
E. A and B

Answer: E

75. The patient’s pulmonary function studies follow:

<table>
<thead>
<tr>
<th></th>
<th>Pre-Bronchodilator</th>
<th>Percent Predicted</th>
</tr>
</thead>
<tbody>
<tr>
<td>FVC</td>
<td>2.53 Liters</td>
<td>72%</td>
</tr>
<tr>
<td>FEV₁</td>
<td>2.07 Liters</td>
<td>85%</td>
</tr>
<tr>
<td>FEV₁/FVC</td>
<td>0.82</td>
<td>114%</td>
</tr>
<tr>
<td>TLC</td>
<td>3.86 Liters</td>
<td>71%</td>
</tr>
<tr>
<td>RV</td>
<td>0.98 Liters</td>
<td>67%</td>
</tr>
<tr>
<td>DLCO</td>
<td>14.53 ml/mm Hg/min</td>
<td>64%</td>
</tr>
</tbody>
</table>

These results suggest:

A. Restrictive lung disease due to neuromuscular process
B. Restrictive lung disease due to a chest wall abnormality
C. Obstructive airways disease
D. Restrictive disease due to a pulmonary parenchymal process
E. Mixed obstructive and restrictive lung disease

Answer: D

76. Potential etiologies for this patient’s problem include:

A. Previous work or recreational exposures
B. Rheumatoid arthritis
C. Ciliary dysmotility
D. All of the above
E. A and B

Answer: E
The above lesion is most likely to be seen in which of the following scenarios:
(3 points)

A. A middle-aged smoker who has developed a form of interstitial pneumonia which will respond to steroids
B. A 60 year old man who has developed the most common form of interstitial pneumonia which will probably not respond to steroid therapy
C. An African-American youth from Georgia who has prominent hilar adenopathy, uveitis, and skin lesions
D. A postpartum patient deep vein thrombosis, chest pain, and hemoptysis

Answer: B
A 52 year old male presents with a complaint of "I can't walk like I used to". The medical student's expert history identifies his problem as being not with his legs but with his lungs. He describes how he easily becomes short of breath, and can't walk as far as he used to without pausing for air. His degree of functional impairment is expertly brought out by the medical student's question: "How many flights of stairs can you walk up?" He used to be able to climb 3 flights without difficulty, but now can barely manage one before having to pause for breath. He can't recall how long this problem has existed, it "just kind of crept up on me very slowly". There is no fever, cough, or sputum production. No one else in his family has experienced the same problem. He smokes one PPD cigarettes, and owns his own farm northwest of Providence.

After a lengthy but fruitless workup, a thoracoscopic lung biopsy is obtained (see photo above). What is the most likely diagnosis? (3 points)

A. Tuberculosis  
B. UIP  
C. Hypersensitivity pneumonitis  
D. Chronic thromboembolic disease  
E. Monday morning fever.

Answer: C

The diagrams below represent a normal acinus and an acinus from a disease process.
79. Which of the following is most likely? (2 points)

A. The patient was a smoker  
B. The patient has 1-antitrypsin deficiency  
C. The patient has cystic fibrosis

Answer: A

80. The above pathological process resulted from an imbalance in elastase-antielastase activity occurring at the: (2 points)

A. bifurcations of respiratory bronchioles  
B. junctions of alveolar sacs and alveoli  
C. level of the secondary bronchi associated with obstruction

Answer: A
81. The predominant histological feature in viral pneumonia is extensive accumulation of lymphocytes in the alveolar spaces. (1 point)

A. True
B. False

Answer: B

82. Name the malignant lung tumor which is characterized by keratinization, intercellular bridges, and highest frequency of p53 mutations is: Fill in the blank(1 point)

83. State briefly the reason why, in contrast to a renal artery embolus, a pulmonary embolus often does not result in a pulmonary infarct and why pulmonary infarcts, when they do occur, are likely to be hemorrhagic? (1 or 2 sentences will suffice) (2 points)

84. Once infected with mycobacterium tuberculosis (LTBI), which of the following do not increase an individual’s risk of developing active tuberculosis?

A. If the initial infection occurs between the ages of 4 and 14
B. If the individual is HIV positive
C. In the first two years after initial infection
D. If the initial infection occurs before age 4

Answer: A