1. A 42 year old previously healthy patient presents to the clinic with sudden onset of fevers, chills and blood tinged sputum. On physical examination, there is evidence of right lower lobar consolidation. The patient is otherwise healthy and had a negative PPD 3 months ago as part of his routine examination at work. He denies weight loss, travel or other symptoms. Which of the following lab values would most likely be seen in this patient?
   a. Gram negative rods
   b. Gram positive cocci in pairs
   c. Small, obligate, intracellular bacterium
   d. Gram positive cocci in clusters
   e. Intracellular aerobic bacterium gram negative rods

2. Which of the following is increased in patients with emphysema- dominant chronic obstructive pulmonary disease?
   a. Diffusing capacity of the lung for carbon monoxide (DLCO)
   b. Forced vital capacity (FVC)
   c. Forced expiratory volume in 1 second (FEV1)
   d. Residual volume (RV)
   e. Alpha-1 antitrypsin levels

3. A 33-year-old patient presents to the emergency room with intermittent right-sided sharp pleuritic chest pain. The chest pain is not positional. There is dullness to percussion, decreased breath sounds on and decreased fremitus all on the right side. ECG shows no ST elevations or T wave changes. Based on the physical exam findings, which of the following would be the most appropriate management of this patient?
   a. administration of ceftriaxone and azithromycin
   b. thoracentesis
   c. needle decompression followed by insertion of a chest tube
   d. insertion of a chest tube
   e. administration of aspirin

4. A 7-year-old boy presents to the pediatric urgent care center for 3 days of low-grade fever, runny nose, sore throat and nonproductive cough. On physical examination, the lung exam is unremarkable for lobar consolidation. HEENT examination reveals a mildly erythematous pharynx and fluid-filled blisters on the tympanic membrane. A rapid strep test is performed and is negative. He is stable for discharge. Which of the following is considered the management of choice in this patient?
   a. doxycycline
   b. levofloxacin
   c. ceftriaxone
   d. azithromycin
   e. ceftriaxone + azithromycin
5. A 32-year old physician who recently moved to the United States from mainland China presents to the clinic for routine yearly testing. The patient is asked during routine history about any symptoms and he denies chest pain, hemoptysis, weight loss, fevers or chills. A PPD is placed, and 48 hours later, reveals 10mm of induration and 5mm of erythema. Which of the following is considered the management of choice?

a. isoniazid + pyridoxine (B6) total duration of treatment for 9 months
b. isoniazid + rifampin + ethambutol + pyrazinamide (total treatment duration of 9 months)
c. isoniazid + rifampin + ethambutol + streptomycin (total treatment duration of 6 months)
d. isoniazid + pyridoxine (B6) total duration of treatment for 12 months
e. ceftriaxone + azithromycin

6. A 42-year old male was involved in a car accident and came to the hospital in cardiac arrest. The patient was intubated during the arrest. After about 2 weeks of being in the intensive care unit, he develops oxygen desaturation. A portable chest radiograph shows a right lower lobe pneumonia. Which of the following is the most appropriate management of this patient?

a. azithromycin
b. doxycycline
c. ceftriaxone + azithromycin
d. metronidazole
e. piperacillin/tazobactam + gentamicin

7. A 10-year-old patient is being evaluated for a well visit. He is below the weight percentile for his age. He has been complaining of bulky, fatty, foul-smelling stools as well as intermittent constipation. The patient also has had a lifetime history of recurrent pulmonary infections. Which of the following would be elevated in this patient?

a. lactate dehydrogenase
b. alpha-1 antitrypsin
c. chloride on a sweat test
d. angiotensin converting enzyme
e. serum sodium levels
8. A 54-year-old male presents with hemoptysis and cough. He complains of intermittent episodes of wheezing, diarrhea, flushing and tachycardia. A bronchoscopy is performed, revealing a pink/purple, well-vascularized central lesion. Which of the following is the most likely diagnosis?
   a. bronchial carcinoid tumor
   b. non small cell lung carcinoma
   c. tuberculosis
   d. small cell lung carcinoma
   e. solitary pulmonary nodule

9. Which of the following medications is used as first line management to reduce pulmonary arterial pressure in patients who are diagnosed with idiopathic pulmonary hypertension?
   a. beta blockers
   b. ACE inhibitors
   c. calcium channel blockers
   d. corticosteroids
   e. diuretics

10. A 28-year-old male presents to the clinic with a 3 month history of persistent, nonproductive cough & shortness of breath that is worsened with exertion. Chest radiographs are obtained and shows the following:
Which of the following biopsies would be most consistent with the suspected diagnosis?

a. tissue infiltrated with streptococcus pneumoniae
b. tissue infiltrated with caseating granulomas
c. tissue infiltrated with cells consistent with squamous cell carcinoma
d. tissue infiltrated with noncaseating granulomas
e. tissue with enlarged alveoli and enlarged small airways

**QUESTION 1**

**Choice B (Gram positive cocci in pairs) is correct.** Streptococcus pneumonia is the most common cause of community acquired pneumonia (causing up to 65% of cases). Besides being the most common cause, clues in the vignette are a lobar consolidation (typical pneumonia) but more importantly sudden onset of chills and blood-tinged sputum.

Choice a is incorrect because gram negative rods, such as Pseudomonas, E. coli are associated with hospital acquired pneumonia.

Choice c describes the bacteria Mycoplasma pneumoniae. It classically causes an atypical picture (it is the most common cause of walking pneumonia) and is associated with blisters on the tympanic membrane (bullous myringitis) as well as positive cold agglutinin autoimmune hemolytic anemia. Mycoplasma lacks a cell wall so beta lactams (such as ceftriaxone & piperacillin/tazobactam) are ineffective against mycoplasma (since the mechanism of action of beta lactams is inhibition of cell wall synthesis). Mycoplasma is often treated with macrolides or doxycycline.

Choice d describes staphylococcus aureus. Staph aureus is commonly associated with pneumonia after a viral infection, such as a complication of pneumonia (and may cause cavitary lesions). Cavitary lesions are often also seen with Klebsiella (a gram negative rod)

Choice e describes the bacteria chlamydia (chlamydophila) pneumoniae. It classically causes an atypical picture and is associated with pneumonia but also causes a concurrent sinusitis, laryngitis or viral symptoms.

**QUESTION 2**

**Choice D (residual volume) is correct.** Obstructive diseases (such as COPD, Bronchiectasis) are associated with increased lung volumes (such as residual volume) reflecting air trapping (obstruction). All the others are decreased in emphysema.

Choice A (DLCO) is decreased. Any disease that decreases the alveolar total surface area will decrease the DLCO. The alveolar destruction in emphysema leads to a decreased DLCO.

Choice B (FVC) will be decreased. FVC represents the amount of air that can be forcibly exhaled from the lungs after taking the deepest possible breath. Because the disorder is obstruction (air cannot get out) there will be less air that can be forcibly exhaled from the lungs.
Choice C (FEV1) is decreased. Because the disorder is obstruction (air cannot get out) there will be less air that can be forcibly exhaled in 1 second. In obstructive disorders the FEV1 is decreased and the FEV1/FVC ratio is also decreased.

Choice E (alpha-1 antitrypsin) is also decreased. Alpha-1 antitrypsin is a protein in the lungs that prevents the enzyme elastase and macrophage enzymes from destroying the elastic tissue of the lung. Smoking increases white blood cells (inflammatory response to the particles in cigarettes) as well as cause a relative alpha-1 antitrypsin deficiency leading to decreased elasticity (increased compliance – meaning it is easier to expand the lung than it is for the lung to recoil back to its original shape, leading to increased residual volume).

**QUESTION 3**

*Choice B (thoracentesis) is correct.* Decreased fremitus, breath sounds and dullness to percussion are the classic physical exam findings of pleural effusion, so a thoracentesis can be both diagnostic and therapeutic.

Choice A would have been the treatment for community acquired bacterial pneumonia in a patient who will be admitted to the hospital and treated as an inpatient. Physical exam would have shown egophony and increased fremitus.

Choice C (needle decompression followed by insertion of a chest tube) is the treatment for tension pneumothorax (which would be hyper resonant to percussion with tracheal deviation to the contralateral side).

Choice D is treatment for pneumothorax that is greater than 30%

Choice E is part of the initial treatment in acute coronary syndrome. The pain in acute coronary syndrome is usually done and not affected by inspiration. In many cases there would be an abnormal ECG.

**QUESTION 4**

*Choice D (azithromycin) is correct.* The fluid filled blisters on the tympanic membrane is consistent with mycoplasma pneumonia. The treatment of choice in general for mycoplasma pneumonia and empiric treatment for community acquired pneumonia is a macrolide or doxycycline, but due to his age, choice A (doxycycline) would be inappropriate as tetracyclines have been known to cause permanent dental staining in children >8 year old. Had he been older, both A and D would have been acceptable. His age is the discriminating factor in this vignette.

Choice B is a fluoroquinolone and is not used in children under the age of 18 because it can interfere with articular cartilage formation and function (such as growth plate arrest). Even in adults, fluoroquinolones aren’t used as first line empiric treatment for community acquired pneumonia. It would however may be used as first line IF he had a history of recent antibiotic use or in certain comorbid conditions.
Choice C (ceftriaxone) is inappropriate for the management of mycoplasma pneumonia. Ceftriaxone is a third generation cephalosporin (remember beta lactams work by inhibiting cell wall synthesis and mycoplasma pneumonia lacks a cell wall). This is why they are often given with a macrolide for “atypical” additional coverage for organisms like mycoplasma, chlamydia and legionella.

Choice E is the management for community acquired pneumonia in an admitted patient, not for outpatient treatment as ceftriaxone is given intravenously.

**QUESTION 5**

*Choice A (isoniazid + pyridoxine (B6) total duration of treatment for 9 months) is correct.*

This is a 2-step question. The first step is determining if the PPD is positive or not. This is a common thing asked on the boards. First you have to determine your cut off rate by his risk factors. 10mm or greater is considered positive in both health care workers (he is a physician) and immigrants (he is from China). Now that you determine he is positive, the next step is to obtain a chest X ray to rule out active tuberculosis. Once active tuberculosis is ruled out, he is diagnosed with latent TB infection (meaning he is infected but not infectious). You can offer the patient prophylaxis for latent TB infection (he is PPD positive which means he is infected but he is asymptomatic and has a negative X ray which means he is not infectious to other people. The purpose of LTBI is to reduce the incidence of secondary (reactive TB) in the future if the patient’s immune system wanes (ex. getting older, HIV, steroid use, or chemotherapy).

Treatment for Latent TB infection is INH + B6 (to prevent peripheral neuropathy from the INH) for 9 months for the general population.

Choice B (isoniazid + rifampin + ethambutol + pyrazinamide total treatment duration of 9 months) is incorrect because 1) 4 drug treatment is used for active TB (which he does not have) this choice is also wrong because active TB is treated for 6 month total duration, making this incorrect for 2 reasons.

Choice C (isoniazid + rifampin + ethambutol + streptomycin total treatment duration of 6 months) is the treatment for active TB (positive PPD, active symptoms and positive X rays for infection) not latent TB.

Choice D (isoniazid + pyridoxine (B6) total duration of treatment for 12 months] is the treatment of latent TB infection if the patient is HIV positive or has a granuloma seen on chest X ray.

Choice E (ceftriaxone + azithromycin) is the treatment for community acquired pneumonia treated as an inpatient.

**QUESTION 6**

*Choice E (piperacillin/tazobactam + gentamicin) is the correct answer. This patient acquired the infection in the hospital (nosocomial pneumonia). Despite the usual organisms, you must*
cover for pseudomonas in nosocomial pneumonia. Piperacillin is an anti-pseudomonal penicillin and gentamicin is an anti-pseudomonal aminoglycoside.

Choice A (azithromycin) and Choice B (doxycycline) are both used for the treatment of community acquired pneumonia outpatient, not nosocomial pneumonia.

Choice C is treatment for community acquired pneumonia in a patient that is admitted to the hospital.

Choice D (Metronidazole) can be used to cover anaerobic (aspiration pneumonia).

**QUESTION 7**

*Choice C* (chloride sweat test) is the correct answer. In patients with cystic fibrosis, the defect in the chloride transport leads to increased viscosity of secretions, such as the protective mucous (leaving patients prone to multiple infections and the development of bronchiectasis) as well as digestive enzymes (leading to decreased fat absorption, malabsorption and growth delays).

Choice A (LDH) is often elevated in pneumocystis jiroveci pneumonia.

Choice B (AAT deficiency) is a genetic disorder in which patients are prone to developing emphysema and bronchiectasis.

Choice E is incorrect. Pulmonary infections may often cause SIADH, leading to increased water retention causing hyponatremia (decreased sodium levels).

**QUESTION 8**

*Choice A* (carcinoid tumor) is the correct answer. The clues is that carcinoid tumors are neuroendocrine tumors and can intermittently secrete serotonin (causing diarrhea) and histamine (causing bronchoconstriction, flushing and hemodynamic instability). On bronchoscopy the classic finding is a pink/purple well-vascularized lesion. The combination of these 2 in the vignette makes this the best answer.

**QUESTION 9**

*Choice C* (calcium channel blockers) are considered the first line management in idiopathic pulmonary hypertension. Not all patients may respond to this therapy however, but given the choices, it is the best initial management. Other medications used to treat this disorder is phosphodiesterase inhibitors (such as sildenafil), prostacyclins, endothelin receptor antagonists, and oxygen therapy (not the other drugs mentioned in this question).
**QUESTION 10**

*Choice D* (noncaseating granuloma) *is the correct choice.* The bilateral hilar lymphadenopathy is classic for sarcoidosis. Noncaseating granulomas are seen in sarcoidosis. Choice A would be seen in lobar pneumonia.

Choice B would be seen with tuberculosis. These granulomas undergo cases necrosis in the middle to provide an acidic, hypoxemic environment (which inhibits mycobacterium tuberculosis growth).

Choice E describes emphysema (permanent dilation of the terminal airspaces).