

YR 2 RESPIRATORY UNIT EXAMINATION -- April 24, 1998

CHOOSE THE SINGLE BEST ANSWER FOR QUESTIONS 1 - 100.

1. A 63 year old woman presents to the emergency room complaining of 5 days progressive shortness of breath. Her family brought her in because she was increasingly sleepy during the last 24 hours. She was diagnosed with COPD 3 years ago and has a FEV<sub>1</sub> less than 50% of predicted. She is on oxygen at home. Her last known serum HCO<sub>3</sub><sup>-</sup> was 30 mg/dL obtained on a routine chemistry screen last month. Physical examination is significant for a thin, obtunded woman with severe respiratory distress. Respiratory rate is 24 with shallow breaths. Lung exam is significant for decreased breath sounds with minimal air movement.

If an arterial blood gas on room air is performed, which of the following results do you expect?

- |    | <u>pH</u> | <u>PaCO<sub>2</sub></u> | <u>PaO<sub>2</sub></u> | <u>HCO<sub>3</sub></u> |
|----|-----------|-------------------------|------------------------|------------------------|
| A. | 7.32      | 60                      | 70                     | 30                     |
| B. | 7.41      | 40                      | 50                     | 24                     |
| C. | 7.48      | 30                      | 85                     | 24                     |
| D. | 7.16      | 70                      | 50                     | 24                     |
| E. | 7.24      | 80                      | 55                     | 30                     |
2. A 72 year old lifetime smoker presents with progressive dyspnea on exertion. Has a chronic nonproductive cough. On examination patient is thin, breathing with pursed lips, respiratory rate 25, with mild expiratory wheezing on lung examination. Spirometry shows FEV<sub>1</sub> 0.8 L, FVC 1.6 L. Arterial blood gas shows pH = 7.35, PCO<sub>2</sub> = 45, PO<sub>2</sub> = 55.

What is the predominant mechanism of the airflow limitation in this gentleman?

- A. Bronchospasm
- B. Loss of elastic recoil
- C. Increased airways resistance
- D. Mucus plugging in the small airways
- E. Foreign body obstruction

3. Which cell type is responsible for the early asthmatic response?
- A.  $T_{H1}$ -lymphocyte
  - B. Neutrophil
  - C. Eosinophil
  - D. Mast cell
  - E. Basophil

4. A 35 year old man presents after 3 months of chronic cough productive of yellow-green sputum and dyspnea on exertion. The patient relates that he has at least two sinus or bronchial infections per year requiring treatment with antibiotics. He also relates that he and his wife have been unable to have children. Patient is a 2 pack per day smoker. Examination is essentially normal except for wheezing on lung examination with an area of focal crackles at the left lung base. Chest X-ray shows patchy bi-basilar infiltrates. Pulmonary function tests (PFTs):  $FEV_1 = 2.0$  L,  $FVC = 2.7$  L. Arterial blood gases show pH = 7.38,  $PCO_2 = 40$ ,  $PO_2 = 82$ .

What is your MOST likely diagnosis?

- A.  $\alpha_1$ -Antitrypsin (Antiprotease) deficiency
  - B. Hypogammaglobulinemia
  - C. Immotile cilia syndrome
  - D. Asthma
  - E. Cystic fibrosis
5. Non-adrenergic, non-cholinergic neural (NANC) pathways play an important role in the pathogenesis of bronchospasm. Which of the following asthma treatments modulate the activity of these pathways?
- A. Inhaled corticosteroids
  - B. Inhaled  $\beta$ -agonists
  - C. Cromolyn sodium
  - D. Theophylline

6. A 25-year old man has presented to the emergency room with an acute heroin overdose. Upon arrival to the intensive care unit, an arterial blood gas is obtained, which shows a pH of 7.24, PaCO<sub>2</sub> 60 mmHg, PaO<sub>2</sub> 50 mmHg, HCO<sub>3</sub><sup>-</sup> 24 mg/dL. Your resident, who has admitted 6 patients already that night, looks at it and states it that all the values are expected for an acute heroin overdose. When she asks you what you think, you:
- A. Agree.
  - B. Disagree because the alveolar-arterial oxygen gradient should be normal in a pure drug overdose.
  - C. Disagree because the serum pH should be lower for the degree of hypoventilation.
  - D. Disagree because the serum bicarbonate should be higher in acute overdose.
7. A 63-year-old woman with a 3 year history of congestive heart failure experienced an acute episode of right-sided pleuritic chest pain, two weeks after a cholecystectomy (gall bladder resection) complicated by peritonitis. She had been recovering well, up to that point. The most likely cause for the chest pain is:
- A. Bronchiectasis
  - B. Mycoplasma pneumonia
  - C. Left upper lobe abscess
  - D. Infarct of the lung
  - E. Hypersensitivity pneumonitis

8. A 43-year-old African-American female high school teacher complained of slowly increasing breathlessness. She has no smoking history. Following examination and lab work up, you find she has enlarged bilateral hilar lymph nodes, elevated serum calcium, interstitial lung disease, and enlarged liver and spleen. The **MOST** probable diagnosis is:
- A. Tuberculosis
  - B. Sarcoidosis
  - C. Coccidioidomycosis
  - D. Hypervitaminosis D
  - E. Hyperparathyroidism
9. Nasal congestion will increase respiratory system resistance more than early emphysema. Which of the following explanations is **INCORRECT**?
- A. Emphysema affects compliance (change in volume vs. change in pressure) and has little effect on airflow resistance.
  - B. The nose is part of the series of large airways, thus changes in its resistance have major effects on total resistance.
  - C. Early emphysema may affect a large portion of the terminal airways, but there is little effect on total resistance.
  - D. A doubling of nasal resistance will cause a larger change in total resistance than a doubling of small airways resistance.
  - E. Resistances in small airways are in parallel, thus increases in their resistance have little effect on total resistance.

10. Based on the curve below, which one of the following conditions would result in a shift of the oxygen saturation curve from **a** to **b**?

**FIGURE 1**

- A. Change in pH from 7.6 to 7.4
  - B. Change in PCO<sub>2</sub> from 30 to 40
  - C. An increase in 2,3 DPG
  - D. The presence of fetal hemoglobin
  - E. Fever
11. In the curve below, volume-pressure curves for 3 subjects are shown. All subjects are the same age, sex and body size. Which of the following statements is MOST accurate?

**FIGURE 2**

- A. Subject A has a stiff lung (fibrosis)
- B. Subject A has a flabby lung (emphysema)
- C. Subject A has a higher elastic recoil pressure than B or C.
- D. Subject C likely has a higher FRC (functional residual capacity).
- E. Subject C has the lowest elastic recoil pressure of the 3 subjects.

12. Which of the following statements about vital capacity (VC) is TRUE?
- A. Vital capacity, when reduced, is a specific indication of restrictive lung disease
  - B. Vital capacity is increased in emphysema and reduced in interstitial fibrosis
  - C. Vital capacity is the sum of tidal volume (VT) and inspiratory capacity (IC)
  - D. Vital capacity cannot be measured from spirometry alone
  - E. Vital capacity is the maximal amount of air which can be exhaled after maximal inspiration
13. In restrictive lung disease secondary to respiratory muscle weakness, which of the following is TRUE:
- A. Low VC, low FEV<sub>1</sub>, normal TLC, low RV/TLC
  - B. Low FEV<sub>1</sub>/FVC, high RV/TLC
  - C. Low VC, low RV, low TLC
  - D. Low FEV<sub>1</sub>/FVC, normal TLC
  - E. Low VC, low TLC, high RV/TLC
14. A patient presented to a doctor's office with complaints of progressive dyspnea on exertion. Pulmonary function tests were obtained showing FEV<sub>1</sub> = 1.0 L. (42% predicted). FVC = 2.44 : (73% predicted), FEV<sub>1</sub>/FVC = 41% predicted with lung volume measurements demonstrating a TLC = 8.04 L (153% predicted), RV = 5.59 L. (292% predicted) with an elevated RV/TLC ratio. Which of the following statements regarding the patient's lungs is TRUE?
- A. More compliant, with increased elastic recoil leading to expiratory flow limitation
  - B. More compliant, with decreased elastic recoil leading to expiratory flow limitation
  - C. Less compliant, with increased elastic recoil leading to expiratory flow limitation
  - D. Less compliant, with decreased elastic recoil leading to expiratory flow limitation
  - E. More compliant, with normal elastic recoil.

15. Which of the following parameters is a requirement for the diagnosis of restrictive lung disease?
- A. Reduced forced expired volume in one second ( $FEV_1$ )
  - B. Reduced total lung capacity (TLC)
  - C. Reduced residual volume (RV)
  - D. Reduced functional residual capacity (FRC)
  - E. Reduced tidal volume ( $V_T$ )
16. Normal cardiopulmonary response to exercise includes all of the following statements EXCEPT:
- A. Dead space/tidal volume ( $V_D/V_T$ ) ratio decreases
  - B. Normal  $PaO_2$  is maintained
  - C. Respiratory limitation develops at moderate or heavy work loads
  - D. Increased cardiac output with a linear increase in cardiac frequency
  - E. Non-linear increase in respiratory frequency and tidal volume
17. In COPD (chronic obstructive pulmonary disease) patients, each of the following might contribute to limited exercise capacity EXCEPT:
- A. Mechanical disadvantage caused by over-inflation
  - B. Increased minute ventilation requirements caused by high  $V_D/V_T$
  - C. Increased work of breathing caused by airflow limitation
  - D. Increased diaphragmatic muscle fiber length caused by lung over-inflation
  - E. Hypoxia caused by V/Q mismatching

18. A 45 year old physician had an onset of severe, crushing, substernal chest pain while attending a hockey game. He collapsed on his way to the car. Mouth to mouth resuscitation and external cardiac massage were begun immediately and continued until arrival in the ER where an endotracheal tube was inserted and ventilation was maintained using an anesthesia bag and 100% oxygen. Arterial blood gases in the ER were: PaO<sub>2</sub> = 560 mm Hg, PaCO<sub>2</sub> = 18 mm Hg, pH = 7.13, Bicarbonate = 5.8, SaO<sub>2</sub> = 98%. Based on these laboratory values, which of the following statements BEST describes his situation?
- A. He probably developed a large right to left intracardiac shunt
  - B. His anion gap is probably normal.
  - C. He is demonstrating a primary respiratory alkalosis
  - D. His oxyhemoglobin curve is shifted to the left.
  - E. His pulmonary artery pressure is probably elevated.
19. Which of the following patients is MOST likely to have Cor Pulmonale?
- A. A 55 year old obese male with severe (AHI, apnea + hypopnea index = 40 events per hour) sleep apnea, normal pulmonary function tests and normal daytime PaO<sub>2</sub>
  - B. A 61 year old male with emphysema secondary to alpha 1-antitrypsin deficiency. FEV<sub>1</sub> = 50% of predicted, daytime PaO<sub>2</sub> is normal.
  - C. A 42 year old female with steroid dependent asthma who required supplemental oxygen for 2 months following her latest hospitalization.
  - D. A 59 year old obese male with moderately severe sleep apnea (AHI = 25 events per hour), moderate COPD (FEV<sub>1</sub> = 55% of predicted) and daytime PaO<sub>2</sub> of 59.
  - E. A 72 year old female with moderate aortic sclerosis, dyspnea on mild exertion, mildly reduced FVC (75% of predicted and FEF 25-75% at 50% of predicted



20. All of the following may cause pulmonary vasoconstriction EXCEPT:
- A. Alveolar hypoxia
  - B. Hypercapnia
  - C. Nitric oxide
  - D. Thromboxane A<sub>2</sub>
  - E. Acidosis
21. The pulmonary vascular system is different from the systemic vascular system in that the pulmonary system demonstrates:
- A. High pressures, high flow rates, highly compliant vessels
  - B. High pressures, high flow rates, low compliance vessels
  - C. Low pressures, high flow rates, high compliance vessels
  - D. Low pressures, low flow rates, high compliance vessels
  - E. Low pressures, low flow rates, low compliance vessels
22. A 50-year-old woman who has recently had abdominal surgery for colon cancer develops a sudden onset of severe shortness of breath and right sided chest pain. There is no cough. She felt feverish, but when she took her temperature it was 99. Her exam showed tachypnea and tachycardia. There was decreased chest wall motion on the right side and on auscultation of the lungs rare crackles were heard at the right lung base. Her chest x-ray showed no abnormality. Oxygen saturation was recorded as 86% on room air at rest.

All the following are appropriate steps in caring for this patient EXCEPT:

- A. Start heparin to induce anticoagulation for possible pulmonary embolism
- B. Give supplemental oxygen
- C. Start intravenous antibiotics for possible pneumonia
- D. Order studies of the leg vessels to evaluate for deep venous thrombosis
- E. Order specialized radiographic studies to evaluate the pulmonary vasculature.

23. During an episode of sleep apnea, which set of findings would be MOST compatible with CENTRAL sleep apnea?
- A. Arterial oxygen desaturation, hypocapnia, absent nasal airflow, increased diaphragm activity
  - B. Arterial oxygen desaturation, hypocapnia, increased nasal airflow, decreased diaphragm activity
  - C. Arterial oxygen desaturation, hypercapnia, absent nasal airflow, increased diaphragm activity
  - D. Normoxia, hypercapnia, absent nasal airflow, decreased diaphragmatic activity
  - E. Arterial oxygen desaturation, absent nasal airflow, absent diaphragmatic activity
24. Compared to wakefulness, NREM sleep is characterized by all of the following EXCEPT:
- A. Increased upper airway resistance
  - B. Unmasking of the apneic threshold
  - C. Elevated  $PCO_2$
  - D. Increased activity of upper airway dilators
  - E. Reduced tidal volume

25. A 50-year-old male is dragged to the doctor's office by his long suffering wife. His snoring (which has been steadily increasing in volume over the past year or so) is driving her crazy. She reports he grunts and gasps and flails about in the bed on a regular basis. He reports no night time problems. He does admit to gaining 50 pounds over the past year (lost his job, watches lots of TV) and to falling asleep when engaging in quiet activities during the day. A sleep study is performed. Findings MOST compatible with this man's clinical presentation would be:
- A. Progressive oxygen desaturation during the night and alternating periods of hyperventilation and hypoventilation.
  - B. Fragmented sleep, cessations of airflow measured at the nose accompanied by an increase in esophageal pressure swings and episodic oxygen desaturation.
  - C. Normal sleep quality but cessations of airflow measured at the nose with decreased abdominal wall motion during these flow cessations.
  - D. Tachycardia, sleep fragmentation, episodes of hypoventilation with minimal oxygen desaturation.
  - E. Normal sleep quality, bradycardic episodes, oxygen desaturation but normal airflow.
26. Factors predisposing to obstructive sleep apnea include all the following EXCEPT:
- A. Obesity
  - B. Decreased upper airway dilator activity during sleep.
  - C. Decreased diaphragmatic tone during sleep
  - D. Increased upper airway resistance
  - E. Reduction in tidal volume during sleep

27. Cystic fibrosis and Immotile Cilia Syndrome share all the following clinical features EXCEPT:
- A. Nasal polyps
  - B. Recurrent upper and lower respiratory infections
  - C. A genetic defect
  - D. Elevated sweat chloride levels
  - E. Bronchiectasis
28. Survival of an infant born at 26 weeks gestational age is critically dependent upon:
- A. Cuboidal epithelium in the alveoli
  - B. Development of pulmonary arteries and veins
  - C. Amount of surfactant present.
  - D. Adequate airway branching
  - E. Normal cardiac function
29. A 3-year-old child presents to the Pediatrician's office for evaluation. The parents report he has been coughing for the past few months. On examination, the patient is 10th percentile for height and below scale for weight for the stated age. He has had recurrent episodes of otitis media. Based on these factors, what test is the MOST likely to provide useful information about this patient's condition?
- A. Chest radiograph
  - B. Pulmonary function testing
  - C. Biopsy sample of the nasal mucosa
  - D. Sweat chloride testing
  - E. Arterial blood gases

30. A 4 month old male infant is found dead in his crib by his parents. He had a slight viral upper respiratory infection over the past week, but otherwise had been healthy. There are no siblings. On questioning and evaluation, the factor MOST suggestive of a diagnosis of true SIDS (sudden infant death syndrome) would be:
- A. The patient had been sleeping on his stomach
  - B. The temperature in the nursery was 90 degrees F
  - C. The mother is 16 and the father is 18 years old
  - D. History of a premature birth at gestational age 32 weeks
  - E. Absence of any signs of trauma or suffocation
31. In many cases of lung cancer, even though surgery produces better outcomes, it is not considered as a therapeutic option. In which of the cases below might surgical resection of a tumor be reasonable?
- A. A 59 year old male who is found on bronchoscopic exam to have tumor in the right mainstem bronchus extending to within 1 cm of the carina. Pulmonary Function Tests (PFTs) show an FEV<sub>1</sub> of 2.1 liters (65% of predicted normal).
  - B. A 62 year old female with a small peripheral mass who has elevated liver enzymes and a computed tomography (CT) scan showing probable metastatic defects in the liver PFTs show an FEV<sub>1</sub> of 3.5 Liters (80% of predicted normal).
  - C. A 70 year old man with a right lower lobe tumor 2 cm in diameter with no evidence of regional adenopathy or distant spread of disease. PFTs show an FEV<sub>1</sub> of 0.8 Liters (28% predicted).
  - D. A 71 year old male with a 3 cm tumor obstructing the right lower lobe bronchus. PFTs show an FEV<sub>1</sub> of 1.98 L. (43% predicted,)
  - E. A 56 year old female with an adenocarcinoma of the right lung. CT scan shows enlarged lymph nodes in the right and left hila. PFTs show an FEV<sub>1</sub> of 2.25 L. (55% predicted).

32. Which of the following statements about prognosis in lung cancer is TRUE?
- A. With chemotherapy, overall survival in small cell (oat cell) carcinomas has risen to 60% at 5 years
  - B. Overall lung cancer survival is < 15% at 5 years.
  - C. Patients who qualify for surgery have a 50% 5 year survival
  - D. Patients undergoing radiation therapy have a 5 year survival of 40%.
  - E. Combined modality therapy (chemotherapy, radiation therapy and surgery) has improved overall lung cancer survival to 40% at 5 years.
33. A 59 year old male presents with a right pleural effusion, dyspnea and cough. Tapping the effusion reveals an underlying lung mass, 3 cm in diameter, in the periphery of the right lower lobe. Right hilar and subcarinal lymph nodes are enlarged. There is no evidence of metastatic spread of disease. Which of the following statements is true regarding this patient?
- A. The lack of metastatic disease makes him a good surgical candidate
  - B. He most likely has inoperable small cell (oat cell) carcinoma
  - C. He most likely has inoperable adenocarcinoma
  - D. He likely has oat cell carcinoma and will respond well to radiotherapy
  - E. He likely has adenocarcinoma and will response well to chemotherapy.
34. Second hand smoke may be associated with all the following in life long non-smokers EXCEPT:
- A. An increased incidence of lung cancer in non smokers
  - B. Otitis media in children
  - C. Asthma in children
  - D. Declines in pulmonary function
  - E. Mesothelioma

35. A 48-year-old woman presents to the doctor with Cushingoid facies and hyperpigmentation of the skin on her face and chest. She has a 50 pack year smoking history. Her examination reveals no gross abnormalities. Her chest x-ray show a 2 cm irregularly shaped mass in the right upper lobe, in proximity to the mediastinum. A CT guided needle biopsy of the lung lesion is performed. The MOST likely cytologic finding is:
- A. Small cell (oat cell) carcinoma
  - B. Squamous cell carcinoma
  - C. Adenocarcinoma
  - D. Bronchoalveolar cell carcinoma (BAC)
  - E. Benign bronchial adenoma
36. A 30 year old woman presents with a 3 month history of tiring easily and shortness of breath on exertion. The history is otherwise completely negative. On exam, a few crackles are heard over the left mid lung but the remainder of the exam is normal. Her chest x-ray shows bilateral enlargement of the hilar lymph nodes. The MOST USEFUL DIAGNOSTIC test result for this patient would be:
- A. Restrictive process on pulmonary function testing
  - B. Elevated serum angiotensin converting enzyme (sACE).
  - C. Positive Kviem test
  - D. Transbronchial biopsy showing noncaseating granulomas
  - E. Negative PPD

37. A 55-year-old male presents with a 3 month history of tiring easily and shortness of breath on exertion. The history is otherwise unremarkable, although he did recall that the symptoms began after a flu like illness, with fever and joint aches. On exam crackles are heard over both lung bases. The chest x-ray shows a predominantly basilar interstitial infiltrate. Which of the following is TRUE?
- A. BAL (bronchoalveolar lavage) is likely to show a predominance of lymphocytes.
  - B. PPD will likely be positive
  - C. Pulmonary function tests will likely show a restrictive process.
  - D. He will respond well to bronchodilator therapy
  - E. The disease will likely resolve with specific therapy
38. A 47-year-old male presents with dyspnea increasing over 6 months. He comes to the pulmonologist with a PFT showing a moderately severe restrictive process and a chest x-ray showing a diffuse interstitial infiltrate. Which of the following would NOT be appropriate?
- A. Further detailed history to elicit occupational or environmental respiratory exposures
  - B. PPD skin test
  - C. Cardiac evaluation
  - D. Methacholine challenge test
  - E. Biopsy of lung tissue (bronchoscopic or surgical)
39. Which of the following would be the LEAST likely finding in a patient with sarcoidosis
- A. Uveitis
  - B. Restrictive pulmonary function tests
  - C. Hepatic granulomas
  - D. Skin lesions
  - E. X bodies on bronchoalveolar lavage (BAL) fluid



40. A 60-year-old male presents with progressive dyspnea. The history is otherwise negative. Exam is positive for crackles heard over both lungs. Chest x-ray shows a diffuse interstitial infiltrate. A diagnosis of idiopathic pulmonary fibrosis is entertained. Which of the follow would be the LEAST important condition to rule out at this time?
- A. Tuberculosis
  - B. Sarcoidosis
  - C. Lymphangitic spread of cancer
  - D. Asthma
  - E. Asbestosis
41. Which of the following forms of pulmonary embolism can be a cause of secondary pulmonary hypertension MOST commonly?
- A. Fat embolism
  - B. Massive pulmonary embolism (e.g., saddle embolism)
  - C. Paradoxical embolism
  - D. Multiple small recurrent pulmonary embolism
  - E. Air embolism (Caisson's disease)
42. A 49 year old white female presents with complaints of shortness of breath, cough with heavy sputum production, and a low grade fever. She reports a 60 pack year smoking history. Her arterial blood gases showed a mild hypoxemia on room air (pH of 7.4, PaCO<sub>2</sub> of 45 and a PaO<sub>2</sub> of 78). You strongly suspect:
- A. Paraneoplastic syndrome
  - B. Pulmonary embolism
  - C. Chronic bronchitis
  - D. Asthma
  - E. Idiopathic pulmonary fibrosis (IPF)

43. A 31-year-old male HIV-positive, IV-drug abuser has developed increasing shortness of breath, a dry cough and chronic fatigue over the last 4 months, which has become more severe in the last several days. His chest x-ray shows infiltrates in the hilar regions of the lung. During bronchoscopy, bronchoalveolar lavage (BAL) returns a pink, bubbly exudate without inflammatory cell reaction. This patient most likely has:
- A. Histoplasmosis
  - B. Mycobacterium tuberculosis
  - C. Cytomegalovirus pneumonia
  - D. Streptococcal bronchopneumonia
  - E. Pneumocystis carinii pneumonia
44. A 49-year-old man with a long history of alcoholism presents with cough, hemoptysis and pleuritic chest pain. He reports having night sweats and significant weight loss in recent months. A subtle nodular pattern throughout the lung was seen on chest x-ray. Tissue samples from the transbronchial biopsy showed multinucleated giant cells, epithelioid cells and necrotic debris. This man is MOST likely to have:
- A. Tuberculosis
  - B. Small cell carcinoma
  - C. Pneumocystis carinii pneumonia
  - D. Squamous cell carcinoma
  - E. Aspergillosis

45. An 8-year-old girl was found unconscious in a closet by firefighters who rescued her from her burning home. She obviously suffered from smoke inhalation. Unable to breathe adequately on her own, she was mechanically ventilated with 100% O<sub>2</sub>, and positive end-expiratory pressure (PEEP). Adequate oxygenation could not be maintained and she died 4 days later. She was afebrile during this period. At autopsy, the lung histopathology will MOST likely show which process?
- A. Bronchiectasis
  - B. Diffuse alveolar damage (ARDS)
  - C. Viral pneumonia
  - D. Bronchopneumonia
  - E. Massive pulmonary infarction
46. A 67-year-old woman presents with complaints of increasing fatigue, some shortness of breath and a dry cough. Her chest x-ray shows an area of dense pneumonia-like consolidation in the right lower lobe. A course of antibiotics produced no change in her original complaints or chest x-ray. Following bronchioalveolar lavage (BAL) of the patient, the cells retrieved were described by the cytologist as "atypical". The MOST likely diagnosis is:
- A. Mycoplasma pneumonia
  - B. Pulmonary embolism with infarction
  - C. Sarcoidosis
  - D. Bronchioloalveolar cell carcinoma (BAC)
  - E. Pulmonary alveolar proteinosis

47. A 34-year-old male, employed as an mechanical engineer in a large Michigan grain processing company, complains of cough, fever and shortness of breath. He reports his symptoms calm down over the weekend, but rapidly redevelop when he returns to work on Mondays. His chest x-ray reveals nodular infiltrates, widespread in both lung fields. Your MOST likely diagnosis is:
- A. Asbestosis
  - B. Tuberculosis
  - C. Usual interstitial pneumonitis (UIP)
  - D. Silicosis
  - E. Allergic alveolitis (Hypersensitivity pneumonitis)
48. A 20-year-old female college student, with known hypogammaglobulinemia, has a 10 year history of recurrent cough, hemoptysis, and expectoration of copious quantities of mucopurulent sputum. Laboratory analysis of a sputum sample reveals mixed flora including anaerobes. She reports that as a child she had several instances of pneumonia, requiring hospitalization. Your MOST likely diagnosis would be:
- A. Idiopathic pulmonary fibrosis
  - B. Bronchiectasis
  - C. Sarcoidosis
  - D. Reactivation Tuberculosis
  - E. Asthma
49. Alcoholism is a predisposing factor to pneumonia for all of the following reasons EXCEPT:
- A. Impaired level of consciousness
  - B. Abnormal ciliary function
  - C. Abnormal airway mucus
  - D. Malnutrition
  - E. Debilitation

50. All of the following can be classified as interstitial lung disease EXCEPT:
- A. Sarcoidosis
  - B. Rheumatoid arthritis
  - C. Eosinophilic granuloma
  - D. Pneumococcal pneumonia
  - E. Idiopathic pulmonary fibrosis
51. Carcinoid tumors of the lung (bronchial adenomas) originate from what cell type?
- A. Clara cell
  - B. Type 2 Alveolar cell
  - C. Mucus (goblet) cell
  - D. Kulchitsky (K) cell
  - E. Ciliated cell
52. A new patient comes to you who reports he thinks he has lung disease caused by asbestos in the workplace. Which sequence of questions or investigations below is the BEST approach to take with this patient?
- A. Chest x-ray; history (including occupational) and physical; pulmonary function testing; contact employer for more information if needed
  - B. Pulmonary function testing; history (including occupational) and physical; chest x-ray; contact employer for more information if needed
  - C. History (including occupational) and physical; pulmonary function testing; chest x-ray; contact employer for more information if needed
  - D. History (including occupational) and physical; contact employer for more information if needed; chest x-ray; pulmonary function testing
  - E. Contact employer for more information if needed; history (including occupational) and physical, pulmonary function testing; chest x-ray

53. The obstruction which occurs in asthma includes all of the following mechanisms EXCEPT:
- A. Edema of the airway mucosa due to inflammation
  - B. Loss of radial forces of traction on small airway walls
  - C. Mucus plugging of the airways
  - D. Bronchial smooth muscle constriction
54. Interstitial pulmonary fibrosis may be caused by all of the following EXCEPT:
- A. Sarcoidosis
  - B. Asbestosis
  - C. Radiation
  - D. Bronchial asthma
  - E. Connective tissues disease, e.g., scleroderma (PSS)
55. Most of the cells that fill the alveoli in desquamative interstitial pneumonitis (DIP) are:
- A. Lymphocytes
  - B. Macrophages
  - C. Neutrophils
  - D. Plasma cells
  - E. Eosinophils
56. Chronic bronchitis is characterized by all of the following EXCEPT:
- A. Persistent cough with production of sputum
  - B. Increased mucous gland to airway wall ratio
  - C. Mucous cell and squamous cell metaplasia of small airways
  - D. It may be complicated by cor pulmonale
  - E. Decreased vital capacity (VC), total lung capacity (TLC), and increased forced expiratory volume (FEV<sub>1</sub>)

57. Progressive Massive Fibrosis (PMF) is MOST likely to be encountered in:
- A. Lobar pneumonia
  - B. Sarcoidosis
  - C. Complicated silicosis
  - D. Hypersensitivity pneumonitis (EAA)
  - E. Simple coal worker s pneumoconiosis
58. Primary pulmonary hypertension is MOST likely to develop in which of the following patients?
- A. A 10 year old healthy boy
  - B. A 52 year old male smoker
  - C. A previously healthy 31 year old woman
  - D. A 63 year old woman with breast cancer
59. Surgical intervention is the LEAST likely option in which of the following lung cancers?
- A. Bronchioloalveolar carcinoma (BAC)
  - B. Small cell carcinoma
  - C. Adenocarcinoma
  - D. Squamous cell carcinoma
  - E. Giant cell carcinoma

60. The morphologic appearance of *Pneumocystis carinii* infection in the lung is BEST characterized as:
- A. An organizing bronchopneumonia
  - B. An acute respiratory distress syndrome (ARDS) with widespread hyaline membrane formation
  - C. A Bronchopneumonia with abscess formation
  - D. An Interstitial pneumonitis with foamy intra-alveolar exudate
  - E. A hemorrhagic and necrotizing pneumonia
61. Chronic passive congestion (CPC) of the lung is characterized by all of the following EXCEPT:
- A. Congestion of the alveolar capillary bed
  - B. Complication of long standing mitral valve stenosis
  - C. Pulmonary hypertension
  - D. Accumulation of
  - E. Intra-alveolar hyaline membranes



DIRECTIONS: Select the **MOST LIKELY** etiology (A-G below) for the respiratory failure of each patient described in 62-64.

- A. Decreased central nervous system drive
- B. Chest wall disease
- C. Disorder of the respiratory muscles
- D. Disorder of the respiratory motor neurons
- E. Obstructive lung disease
- F. Cardiogenic pulmonary edema
- G. Noncardiogenic pulmonary edema

62. A 45-year old woman presents with 3 days of progressive shortness of breath, abdominal pain, nausea and vomiting. She states that she drinks a fifth of rum every day. The patient appears acutely ill and diaphoretic with a blood pressure of 80/50 and respiratory rate of 40. Examination of the lungs reveals diffuse crackles. The abdomen is diffusely tender with guarding and rebound. Chest x-ray reveals diffuse bilateral alveolar infiltrates; abdominal x-ray reveals dilated duodenal and jejunal loops. Arterial blood gas on room air: pH = 7.25, PCO<sub>2</sub> = 25, PaO<sub>2</sub> = 55, HCO<sub>3</sub><sup>-</sup> = 12.
63. A 32-year old man presents with a 4-day history of progressive weakness in his extremities and 1 day history of shortness of breath. Patient has been healthy except for an upper respiratory tract infection 10 days ago. On exam, his temperature is 37.8°C, respiratory rate is 42 and shallow. He has symmetric weakness of his facial muscles as well as the proximal and distal muscles of the extremities. Sensation is intact. No deep tendon reflexes can be elicited. A forced vital capacity done at the bedside is 1.0 L. Chest x-ray reveals small lung fields only; no infiltrates. Arterial blood gas on room air: pH = 7.32, PCO<sub>2</sub> = 50, PaO<sub>2</sub> = 60, HCO<sub>3</sub><sup>-</sup> = 24.
64. A 55-year old man presents with 1 year history of progressive shortness of breath. His wife states that he has snored all his life and that she frequently witnesses apneic episodes. Patient has gained 100 pounds in the last 2 years and now weighs 450 pounds. Exam is significant for bibasilar crackles, distant heart sounds, and peripheral edema. Chest x-ray shows atelectasis at the bases. Arterial blood gas on room air: pH 7.32, PCO<sub>2</sub> = 60, PaO<sub>2</sub> = 55, HCO<sub>3</sub><sup>-</sup> = 30.

DIRECTIONS: Evaluate the following curve of a vital capacity maneuver done in the pulmonary lab. Choose the letter (A through G) which best fits the question numbered 65 -67 below:

**FIGURE 3**

65. Which letter represents the quantity most likely to increase with asthma?
66. Which letter represents the point of lowest airways resistance?
67. Which letter represents an equal balance of lung and chest wall elastic forces?

DIRECTIONS: Match the MOST likely pathologic consequence listed (A-E below) with the environmental exposures numbered 68 - 70.

- A. Malignant mesothelioma
- B. Alveolar proteinosis
- C. Airway smooth muscle hypertrophy
- D. Bronchiolitis obliterans
- E. Hypersensitivity pneumonitis (EAA)

68. Acute silica exposure

69. Cotton dust

70. Asbestos exposure

DIRECTIONS: Match the following organisms, labeled (A-L below) to the clinical descriptions numbered 71 - 76.

- A. Streptococcus pneumoniae
- B. Mycoplasma pneumoniae
- C. Hemophilus influenzae
- D. Klebsiella pneumoniae
- E. Staphylococcus aureus
- F. Legionella pneumoniae
- G. Peptostreptococcus
- H. Pneumocystis carinii
- I. Coccidioides
- J. Histoplasma
- K. Blastomyces
- L. Aspergillus

- 71. A 30 year old male presents to ER with a 2 week history of progressive shortness of breath. He has been HIV positive for 2 years. His oxygen saturation is 89% on room air at rest. The chest x-ray shows diffuse bilateral interstitial infiltrates.
- 72. A 50 year old male, a regular to the walk in clinic, and known alcoholic street person, comes with a 1 to 2 month history of "not feeling good," He has a cough. He may have lost weight. On exam the physician is struck by the oral exam, which reveals 7 very carious, rotten teeth and extremely bad breath. The chest x-ray shows a cavitory lesion in the right lower lobe.
- 73. A 40 year old woman with no previous medical problems comes to the ER complaining of sudden onset of fever, chills, chest pain and shortness of breath. She is coughing up thick red tinged sputum.
- 74. A 25 year old female comes to her doctor complaining of 6 weeks of feeling achy, dry cough, and painful red bumps on her shins. Further history elicits that 2 or 3 months ago she went on a archeological dig in Arizona looking for Native American artifacts as part of a graduate anthropology course.
- 75. A 59 year old male presents to the ER with a one day history of high fever, recurrent chills, cough productive of yellow sputum. He also complains of diarrhea. Exam shows a temperature of 103 F, pulse of 80, and respirations of 26 per minute. Lung exams shows signs of consolidation over the left lower lobe.
- 76. A 20 year old college senior develops fatigue, weakness, mild shortness of breath and dry cough. He feels feverish but has a temperature of 100.2 F. Two of his four roommates have similar symptoms.

DIRECTIONS: Determine which of the following medical decisions, labeled A-E below, is MOST appropriate for the patient descriptions numbered 77 - 83.

- A. Observation only
- B. Isoniazid therapy
- C. Isoniazid, Rifampin and Pyrazinamide
- D. Isoniazid, Rifampin, Pyranzinamide, Ethambutol and Streptomycin
- E. Isoniazid, Rifampin, Pyranzinamide, Ethambutol, Streptomycin and Ciprofloxacin

77. 50 year old nurse who is found to have a 20 mm PPD. She does not recall being directly exposed to a TB patient. Last year her annual PPD was negative. She has no unusual symptoms and her chest x-ray is negative.

78. A 40 year old prison guard wrestles down a recalcitrant "guest." The prisoner's initial medical exam is positive for cough, sputum production, fevers, night sweats, weight loss. Chest x-ray shows patchy infiltrates in the right upper lung zone. The prisoner's sputum is positive for acid-fast bacteria (AFBs) but cultures are pending. Through a bureaucratic mix up, the guard is not seen by the medical service for 3 weeks. At this time, he has been feeling feverish, has a productive cough. The chest x-ray shows a hazy right lower lobe infiltrate. His PPD is positive at 18 mm.

79. The prisoner described above was placed on anti-tuberculous therapy with Isoniazid, Rifampin and Pyranzinamide. After 6 weeks, he continues to have similar symptoms. His sputum is still AFB positive. The chest x-ray, compared to the one taken on admission to prison, shows worsening. At this time, available laboratory data indicates he is HIV negative. His TB cultures apparently show drug resistance.

- A. Observation only
- B. Isoniazid therapy
- C. Isoniazid, Rifampin and Pyrazinamide
- D. Isoniazid, Rifampin, Pyrazinamide, Ethambutol and Streptomycin
- E. Isoniazid, Rifampin, Pyrazinamide, Ethambutol, Streptomycin and Ciprofloxacin

80. A 58 year old patient with a history of steroid induced diabetes (taking the steroids for severe asthma) is found to have a 4 mm PPD on routine physical exam. She had a previous negative PPD 4 years ago. She has no new symptoms and no new exam findings. Her chest x-ray shows no change from one done 4 years ago.
81. A 40 year old physician is found to have a 10 mm positive PPD. His previous PPD status is unknown. He had immigrated 10 years ago from a country with a high prevalence of TB and has a history of previous BCG vaccination. His exam is normal. His chest x-ray is clear.
82. A 30 year old woman is diagnosed with active TB. Contact investigation reveals she has 2 children ages 18 months and 3 years. PPDs are placed. At 48 hours, the area of induration is 11 mm for the 3 year old, 12 mm for the 18 month old. Neither of the children shows any signs of active disease and chest x-rays were negative.

DIRECTIONS:

Select the MOST likely diagnosis from items listed A-G below for each of the following statements or patient descriptions numbered 83 - 85.

- A. Asthma
- B. Emphysema
- C. Bronchiolitis Obliterans Organizing Pneumonia (BOOP)
- D. Idiopathic Pulmonary Fibrosis (IPF)
- E. Sarcoidosis
- F. Hypersensitivity Pneumonitis (Extrinsic Allergic Alveolitis)
- G. Asbestosis

83. This patient is a 41-year-old male university professor who has become extremely short of breath and is almost unable to climb the 2 flights of stairs to his office each day. He reports never smoking, however, you suspect a diffuse disease after documenting a family history of similar problems and the lab finding that he has the P<sub>1</sub>ZZ genotype.
84. A 37-year-old woman, who reports taking up cigar smoking during the last year, presents to her physician with dyspnea, which worsens on exertion. Pulmonary function tests reveal a restrictive and obstructive pattern and abnormal diffusion capacity. On chest x-ray a bilateral hilar lymphadenopathy is seen. She complains of a constant "bloodshot" eye and the development of papular skin lesions, especially on the lower legs.
85. The patient is 22-year-old college student who just returned from 1 year in Jamaica where he earned money for school by cutting sugar cane 5 days a week on a plantation. He returned early because he felt he was getting sick. He complains of cough, shortness of breath, fever and chills which progressed during the work week and regressed during his 2 non-working days. Pulmonary function tests reveal a restrictive ventilatory impairment, reduced total lung capacity and abnormal gas transfer.

DIRECTIONS:

Match the following patient descriptions or statements, numbered 86 - 100 with the MOST appropriate gross or microscopic photograph listed A-O below. Each alternative may be used **ONLY ONCE**.

- |    |          |    |           |
|----|----------|----|-----------|
| A. | Figure 1 | I. | Figure 9  |
| B. | Figure 2 | J. | Figure 10 |
| C. | Figure 3 | K. | Figure 11 |
| D. | Figure 4 | L. | Figure 12 |
| E. | Figure 5 | M. | Figure 13 |
| F. | Figure 6 | N. | Figure 14 |
| G. | Figure 7 | O. | Figure 15 |
| H. | Figure 8 |    |           |

86. A 41-year-old male visits his doctor complaining of increasing shortness of breath (dyspnea) during the last year. He has been employed for the last 16 years as a sand casting grinder at an iron foundry which has been cited by OSHA (Occupational Safety and Health Administration) several times recently for poor job site safety. He was a "light" smoker (1/2 pack a day for 10 years), but quit 3 years ago. A chest x-ray reveals only a delicate, nodular interstitial lung disease. The MOST likely pulmonary microscopic findings in this patient are best represented by:
87. A 62-year-old female retired librarian presented with a complaint of progressive shortness of breath (dyspnea) on exertion (DOE). She had a 75 pack-year smoking history. On examination, she had distended neck veins on expiration, and a "barrel-shaped" chest. Chest x-ray revealed hyperinflated lungs, and a flattened diaphragm. She has no history of chronic cough, sputum production, or recurrent fever. The microscopic pathology MOST consistent with this patient's disease is represented in which figure?
88. A 55-year-old male cardiologist with a 70 pack/year smoking history, presents with fever, cyanosis, and a productive cough. Chest x-ray shows evidence of a post-obstructive pneumonia and moderate bronchiectasis. Given his history and findings, which of the figures is MOST representative of the gross pathology you expect find in this patient?
89. A 32 year-old female hospice caretaker comes to the ER in severe acute respiratory distress complaining of "flu" symptoms that have developed over the last several days. She is hypoxemic, unresponsive to oxygen therapy, and assisted ventilation. Her course is rapidly downhill and she dies 32 hours later. Microscopic pathology consistent with her expected lung injury is BEST represented by:



- |    |          |    |           |
|----|----------|----|-----------|
| A. | Figure 1 | I. | Figure 9  |
| B. | Figure 2 | J. | Figure 10 |
| C. | Figure 3 | K. | Figure 11 |
| D. | Figure 4 | L. | Figure 12 |
| E. | Figure 5 | M. | Figure 13 |
| F. | Figure 6 | N. | Figure 14 |
| G. | Figure 7 | O. | Figure 15 |
| H. | Figure 8 |    |           |

90. A 62-year-old male, who recently retired after working as a building demolition expert for 32 years, complains of increasing dyspnea during the last 10 months. He has a 60 pack-year smoking, but stopped 8 years ago. His chest x-ray shows interstitial lung disease, as well as diaphragmatic and pleural plaques. The most likely pulmonary microscopic findings in this patient are best represented by:
91. A 63 year-old female presents with a chronic cough productive of sputum, mildly obtunded and cyanotic. She reports being a "heavy" smoker for over 30 years. She has no fever. Her chest x-ray shows hyperinflation and flattened diaphragms. On pulmonary function testing, her FEV<sub>1</sub> and FEV<sub>1</sub>/FVC are reduced. Microscopic histopathology MOST consistent with her history and physical findings is represented in:
92. A 29-year-old woman graduate student presents to her primary care physician complaining of breathlessness (dyspnea) and "lightheadedness" on exertion. These episodes have increased in severity over the last 2 years. Her physician suspects a clinical diagnosis of primary pulmonary hypertension following her sudden death during a morning jog. Histopathology consistent with this diagnosis, would BEST be represented by which figure?
93. A 18-year-old female, who had been diagnosed with asthma at age 10, suffers an acute asthma attack after helping her father clean the furnace humidifier. She rapidly develops a cough productive of purulent sputum, fever, malaise and prostration. She recovers within 48 hours. You suspect an allergic reaction triggered by an organism present in the humidifier. The cause of this patient's disease is MOST likely represented by the microscopic image visible in:

- |    |          |    |           |
|----|----------|----|-----------|
| A. | Figure 1 | I. | Figure 9  |
| B. | Figure 2 | J. | Figure 10 |
| C. | Figure 3 | K. | Figure 11 |
| D. | Figure 4 | L. | Figure 12 |
| E. | Figure 5 | M. | Figure 13 |
| F. | Figure 6 | N. | Figure 14 |
| G. | Figure 7 | O. | Figure 15 |
| H. | Figure 8 |    |           |

94. A 49 year-old woman has developed pain and weakness of the left shoulder and arm. Upon physical exam, she shows a drooping upper eyelid, constricted pupil and dry facial skin, all on the left side. Her chest film shows bone lysis in the 2<sup>nd</sup> rib and adjacent vertebrae. The lung pathology you would anticipate in this patient is BEST represented by:
95. A 55-year-old male with hypertension and congestive heart failure was recuperating from a fall down the cellar stairs in which he fractured his left hip. After two weeks of immobility, he got out of bed to use the toilet and suffered an intense left sided pleuritic pain which was accompanied by severe shortness of breath. He died 4 hours later after being admitted to the hospital. The pulmonary pathology accounting for these findings is MOST likely represented by:
96. A 47-year-old man presented to his doctor with cough, hemoptysis and pleuritic chest pain. He has a history of alcoholism and says he has night sweats and has lost a lot of weight recently. His chest x-ray shows a diffuse, delicate nodular pattern in both lung fields. A transbronchial biopsy showed epithelioid cells and necrotic debris. This patient MOST likely has the disease process shown in figure:
97. A 51-year-old man was seen by his physician for a routine annual physical, at which time the patient related that he had not been feeling well for the last several weeks. Physical examination revealed a fatigued and lethargic man. His blood pressure was 155/91 mm Hg, respiratory rate 25/min, temperature 98.8 F, and heart rate 90 beats/min. Physical findings included decreased breath sounds on the right side, marked weakness of both legs, and "puffy" appearance of the face. His chest film showed a hilar mass in the right lung, diagnosed as bronchogenic carcinoma. Additional laboratory studies revealed high serum ACTH, cortisol and aldosterone levels. MRI scan revealed no brain abnormality, while a CT scan of the abdomen revealed bilateral adrenal gland hyperplasia. The pathology MOST consistent with this patient's pulmonary disease process is shown in:

- |    |          |    |           |
|----|----------|----|-----------|
| A. | Figure 1 | I. | Figure 9  |
| B. | Figure 2 | J. | Figure 10 |
| C. | Figure 3 | K. | Figure 11 |
| D. | Figure 4 | L. | Figure 12 |
| E. | Figure 5 | M. | Figure 13 |
| F. | Figure 6 | N. | Figure 14 |
| G. | Figure 7 | O. | Figure 15 |
| H. | Figure 8 |    |           |

98. Following a traffic accident, a 15- year-old boy was being resuscitated and intravenous fluid being administered. For reasons not clear, the patient received a massive fluid overload. He rapidly developed respiratory distress. From the images shown above, which would you choose as the MOST likely pathological process occurring in this patient's lungs?
99. A 28-year-old male, who is a recent immigrant from Norway, was seen by a physician for increasing shortness of breath, low grade fever, general malaise and some recent weight loss. Pulmonary function studies showed both restrictive and obstructive patterns. Laboratory studies reported elevated levels of serum calcium and angiotensin converting enzyme, and chest x-rays showed mild bilateral mediastinal lymph node enlargement. A transbronchial biopsy of this patient would MOST likely reveal which of the above pathological processes?
100. Many patients who develop idiopathic interstitial lung disease may progress to marked fibrosis and end stage or "Honeycomb" lung. However, an early form of this interstitial pneumonitis, displayed in one of the above images, responds well to steroid therapy reversing the process before the interstitial fibrosis begins. Which image BEST represents this disease process?