



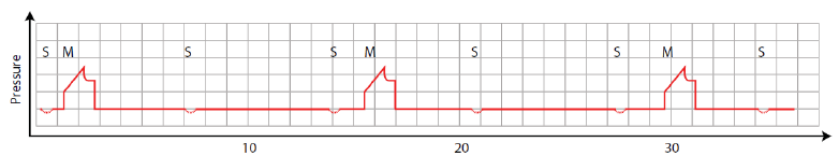
Medical Equipment II Term Exam – May 2014 (Model Answer)

Solve as Much as You Can – Maximum Grade: 50 Points

Part I. Answer these questions by marking the best answer from the choices given: [2 points each]:

1. Spiral CT scanning is different from fourth generation CT scanners in including ...
 - a. Table motion (*)
 - b. Fan beam scanning
 - c. Parallel beam scanning
2. To generate CT images of soft tissues and bone in a patient, ... is used.
 - a. Two CT scans are performed using different kVs
 - b. Two CT scans are performed with different patient positions
 - c. Two HU display windows are used using data from a single CT scan (*)
3. Compared to plain x-rays, computed tomography has a disadvantage in that ...
 - a. It can reconstruct cross sectional images
 - b. It has lower resolution (*)
 - c. It is digital
4. Difference between the second and third generations of CT scanners is in ...
 - a. Rotational motion of detectors
 - b. Lateral motion of detectors (*)
 - c. Lateral and rotational motion of detectors
5. Venous clamp is activated in the condition when ...
 - a. High blood pressure was detected
 - b. Air bubbles in blood are detected (*)
 - c. Blood leakage in dialysate was detected
6. To reconstruct a 200×200 CT image, at least ... projections are needed.
 - a. 10000
 - b. 40000 (*)
 - c. 80000
7. The central opening, into which the patient is moved during the examination is called ...
 - a. Table
 - b. Gantry (*)
 - c. Couch
8. For a tissue with attenuation coefficient that is half that of water, the CT number will be ... HU.
 - a. +500
 - b. 0
 - c. -500 (*)
9. Pressure sensors are used in the blood circuit to ...
 - a. Detect any leakage in the blood circuit (*)
 - b. Prevent air bubbles from forming in blood
 - c. Prevent coagulation of blood in the extracorporeal circuit

10. Ultrafiltration rate in hemodialysis system is controlled by ...
 - a. Dialysate pump (*)
 - b. Blood pump
 - c. Bypass valve
11. The hemodialysis process involves ...
 - a. Diffusion of waste metabolites
 - b. Ultrafiltration of water from blood
 - c. Both of the above (*)
12. Detection of unsafe dialysate concentration in hemodialysis activates ...
 - a. Bypass valve (*)
 - b. Dialysate pump
 - c. Venous clamp
13. For patients with ability to exert respiratory effort but need assistance, preferred mode of breathing is ...
 - a. Spontaneous breathing
 - b. Mandatory breathing
 - c. Triggered breathing (*)
14. The parameter that is measured and used to start inspiration is called ...
 - a. Baseline variable
 - b. Trigger variable (*)
 - c. Limit variable
15. When a break in the dialyzer is detected, ...
 - a. Blood pump is shut off (*)
 - b. Dialysate pump is stopped
 - c. Bypass valve is activated
16. Safety of dialysate is checked before passing through dialyzer using ... measurements.
 - a. Temperature
 - b. Conductivity
 - c. Temperature and conductivity (*)
17. At higher altitudes while running, the efficiency of oxygen exchange is lower due to ...
 - a. Shorter contact time
 - b. Thicker alveolar epithelium
 - c. Lower oxygen concentration in air (*)
18. The lungs have ... compliance than proximal airways.
 - a. Lower
 - b. Higher (*)
 - c. Same
19. The following pressure-volume relationship describes ... breathing mode.
 - a. Mandatory + Triggered
 - b. Synchronized + supported
 - c. Spontaneous + Mandatory (*)



20. Consider a hemodialysis session to remove 1 Kg of water from patient per hour with dialysate flow rate of 0.8 L/min, largest allowed error of ultrafiltration rate measurement on commercial systems will be ...
- ± 50 gm/hr (*)
 - ± 100 gm/hr
 - ± 200 gm/hr

Part II. Mark the following statements as True (T) or False (F) [1 point each]:

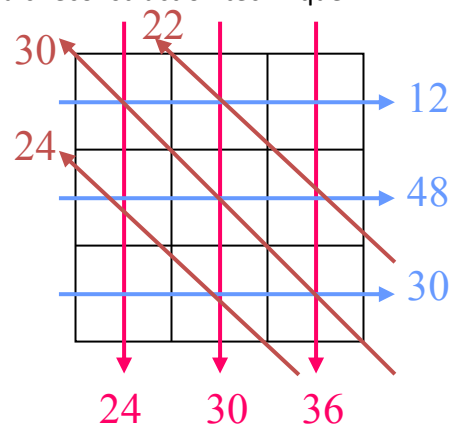
- In CT systems, all x-ray sources and detectors are located in the gantry. (T)
- Fan beam CT is faster than parallel beam CT. (T)
- Computed tomography offers cross-sectional images that are not possible using conventional x-rays. (T)
- It is possible to measure the slice thickness of a CT scanner using a special phantom. (T)
- Blood line is cleaned and disinfected in between patients. (F)
- When there is a dialysate blood leak alarm, blood circuit must stop. (T)
- Expiratory cycling can be done using time or flow measurement. (T)
- Mandatory breathing is triggered by spontaneous breathing in NIV. (F)
- Low lung compliance means that the lung expands easily. (F)
- The smaller the cycle time of a CT device, the more likely motion artifacts will be present. (F)
- The CT image is a map of the linear attenuation coefficient within the scanned section. (T)
- The linearity parameter of CT systems measures the homogeneity of the image. (F)
- CT systems with high contrast detail parameter are better than those with low contrast detail. (T)
- CT systems with larger Computed Tomography Dose Index (CTDI) parameter are preferred. (F)
- Integrity of the dialyzer in hemodialysis is monitored by blood pressure sensors. (F)
- Bypass valve must be activated to bypass dialyzer during conductivity alarm conditions. (T)
- Ultrasonic blood leak detectors are more widely used in new dialysis machines. (F)
- Modern hemodialysis systems with new safety features still require human monitoring of operation. (T)
- The pressure inside smaller alveoli is less than the pressure inside larger alveoli. (T)
- Exactly when phase transition occurs in NIV is determined only by the ventilator. (F)

Part III. Answer the following problem:

41. [5 points] Solve the shown reconstruction problem using algebraic reconstruction technique.

Solution: Go over all equations with the update formula

2	4	6
14	16	18
81	0	12



Best of luck!