

Example questions for Quiz 4

1. A clinical laboratory can be divided into the following major divisions:
 - Hematology
 - Biochemistry
 - Molecular diagnostics
 - Microbiology
 - Histology
 - a. For each division, select one instrument that makes optical, electrical, or chemical measurements. For each instrument, briefly describe the purpose and method for the optical, chemical or electrical measurement, and also describe one mechanical component or function that is essential to the performance of the device. [For example, in the microbiology division the optical measurement measurement might be visual inspection of the microbiological culture, and the mechanical function could be the uncapping and capping of the specimen. This is the weakest example of the four divisions.]
 - b. For each division, state one step of the analytical process that can be or has been automated. State three advantages of the automation and one disadvantage. Each advantage or disadvantage may apply to any or all of the steps, they do not need to apply to all three.
2. Tumor cells can be ablated (killed so that they degenerate and disappear) by deposition of gamma radiation, high-intensity ultrasound, high-frequency electrical current, or very low temperatures (cryosurgery). State two ways that gamma radiation and HIFU are alike, but different from electrical or low-temperature ablation. State two ways that electrical or low-temperature ablation are alike but different from gamma and HIFU radiation. State one major risk associated with HIFU or gamma radiation, and what procedures or technology is used to minimize that risk. State one advantage of HIFU over gamma radiation. State one major risk associated with application of electrical current, and how that risk is minimized in electrosurgical units. State one advantage of HIFU over gamma radiation.
3. According to 2006 statistics from the National Safety Council, rank the following causes of death from most common to least common: a) Drowning b) electricity c) intentional self harm d) lung cancer e) venomous/stinging animals.
4. If you have 100 mA at 60 Hz passing from hand to hand, you would be likely to experience which of the following: a) significant burns, b) difficulty breathing, c) inability to let go of any wires that you are holding, d) a sensation of electricity passing through your fingers/hands, e) cardiac ischemia, due to blockage in the coronary artery, f) sustained contraction of the heart. Would this situation be macroshock or microshock? Why was it important that this problem specified the current *and* the frequency at which it oscillates?
5. Briefly explain why more current can sometimes be better than less current passing through or across the chest.
6. Explain three ways that macroshock hazards are minimized in general practice, and especially in hospitals. Explain two additional ways in which microshocks are avoided in patient monitoring systems.

7. What is considered to be the safe upper limit for microshock? What is the target current limitation in clinical equipment with a pathway to the heart? [answer: 20 microamps and 20 microamps, respectively]
8. Why is it useful to put the instrumentation amplifier on the patient side of the isolation amplifier and isolation power supply?