

Assessment

Clinical Laboratory Techniques and Microtechnology

Instructor Guide

Notes to Instructor

This assessment helps to evaluate the participants' knowledge of clinical laboratory techniques and how microtechnology and bioMEMS devices can be used for some of the testing procedures. This assessment is the same as the Knowledge Probe (KP). By comparing the results to the KP, you can determine learning took place by completing this Learning Module.

This assessment is part of the Clinical Laboratory Techniques and Microtechnology Learning Module:

- Knowledge Probe(KP) (Pre-test)
- Clinical Laboratory Techniques and Microtechnology_PK
- A Micro-Sized Testing Device: Activity
- **LM Assessment**

Introduction

The purpose of this assessment is to evaluate your understanding of clinical laboratory techniques and how microtechnology and bioMEMS devices can be used for some of the testing procedures.

There are ten (10) multiple choice questions and five (5) short answer questions.

1. Which of the following is NOT an advantage of applying microtechnology to clinical laboratory tests?
 - a. Decreased costs as a result of miniaturization
 - b. Larger sample size**
 - c. Point of care testing
 - d. Simultaneous testing from one sample
2. Certain analytes such as HIV, HCV, glucose levels and certain drugs can now be tested on site or at home using what type of device?
 - a. Testing swabs
 - b. Magnetic microbeads
 - c. Microarrays
 - d. POC devices**

3. Blood, plasma, spinal fluid, joint fluid, saliva, and blood cells – these are examples of...
 - a. **Bodily components that can be tested in a clinical laboratory**
 - b. Fluids currently and commonly test using LOCs
 - c. Test sample analytes for point-of-care devices

4. What does it mean when a test is qualitative? The test...
 - a. requires a qualified, training individual to describe and analyze the test.
 - b. estimates the concentration of an analyte in a sample.
 - c. determines the exact concentration of an analyte in a sample.
 - d. **determines the presence or absence of an analyte in a sample.**

5. What does it mean when a test is quantitative? The test...
 - a. requires a qualified, training individual to describe and analyze the test.
 - b. estimates the concentration of an analyte in a sample.
 - c. **determines the exact concentration of an analyte in a sample.**
 - d. determines the presence or absence of an analyte in a sample.

6. LOC and POC devices can receive a sample as small as a micro, nano or picoliters, and, in many cases, are able to analyze a variety of components in the sample simultaneously. Which of the following microtechnologies has enabled such devices?
 - a. Micro-optics
 - b. Surface micromachining
 - c. **Microfluidics**
 - d. Magnetic microbeads

7. Which of the following technologies has been shown to enable 3D cell growth by “levitating” the cells?
 - a. Micro-optics
 - b. Surface micromachining
 - c. Microfluidics
 - d. **Magnetic microbeads**

8. Which of the following is used to ensure that testing methods, instruments and procedures are consistent between clinical laboratories nationwide?
 - a. A national database of certified equipment, procedures and laboratory personnel open to all clinical laboratories.
 - b. National certification training programs that can be taken on-line or on-site by laboratories technicians.
 - c. **Certification of laboratory trainings programs, laboratories, and personnel by governmental and independent agencies.**
 - d. A national standard for all testing methods, instruments and procedures that must be used by all laboratories.

9. What type or area of clinical laboratory testing is used for the study of infections and inherited diseases?
- Microbiology
 - Blood chemistry
 - Histology
 - Bloodtest
 - Molecular diagnostics**
10. What type or area of clinical laboratory testing is used for culturing bacteria for the purpose of identifying an organism?
- Microbiology**
 - Blood chemistry
 - Histology
 - Bloodtest
 - Molecular diagnostics
11. Discuss an advantage and a disadvantage in replacing existing clinical laboratory techniques with micro-sized devices.

Answer - Advantages

- Decreased costs as a result of miniaturization***
- Smaller samples size***
- Ability to do the tests at home or in the field (point of care testing)***
- Ability to multiplex tests (test for several things in one sample)***

Disadvantage

- The concentrations of some analytes are too low for the test to be miniaturized requiring a large sample size, a size too large for MEMS.***

12. Discuss how microfluidics technology is enabling point of care (POC) clinical lab testing.

Answer: Microfluidics is allowing for the fabrication of small hand held devices that contain micro-sized reservoirs and channels. Because the reservoirs and channels are so small, the device itself can be small and can receive a sample as small as a micro, nano, or picoliter. In some cases, the sample can be analyzed by the device for a variety of components simultaneously

13. List five specific clinical laboratory techniques or tests that can now be done at the point of care of at home due to microtechnology.

Answer: HIV, HCV, HBV, insulin testing, drug and alcohol detection, certain viruses, INR (blood coagulation), pregnancy

14. What types of agencies certify training programs, clinical laboratory personnel, and the laboratories themselves?

Answer: Both governmental and independent agencies certify training programs, laboratories and personnel.

15. Why is certification of clinical laboratory testing important?

WHY? To ensure that the testing methods, instruments and procedures are consistent between labs. This helps to create a standardized range or reference value of specific parameters for all labs nationwide.

Support for this work was provided by the National Science Foundation's Advanced Technological Education (ATE) Program through Grants. For more learning modules related to microtechnology, visit the SCME website (<http://scme-support.org/>).