Massachusetts CTE Teacher Testing Program
Biotechnology Content Outline

Written and Performance Exam General Overview

- The intent of this exam is to assess the candidate's ability to teach the skills found in the Massachusetts Technical Education Framework.
- The written exam is a state-developed exam aligned to the frameworks which can be accessed here. The performance exam is a NOCTI-developed teacher test and has been determined by DESE to align to the state frameworks.
- Many questions and tasks require a synthesis of knowledge based on experience in the field and may not be found in any book.
- Use this exam outline and the Massachusetts Technical Education Framework to focus your preparation for the exams.
- Candidates are encouraged to prepare for their written exam by reviewing textbooks and reference material which have been listed as part of this exam outline. These resources can be found using online search tools, online vendors, and websites.

Written Exam

- Number of Questions: 100
- Administration Time: 3 hours
- Passing Score: 70.0%
- Administration Method: Remote Proctored Online Testing Session

Written Exam Content Coverage

10% ***Health and Safety***

- Fundamentals
- Safety in the Biotechnology Laboratory

5% ***Basic Biotechnology Knowledge and Skills***

- Biotechnology Industry Fundamentals
- Knowledge of Regulatory Affairs
- Basic Lab Management Skills

5% ***Biomanufacturing Fundamentals***

- Manufacturing Process Management Techniques

20% ***Solution Preparation***

- Perform Calculations
- Prepare Solutions

40% ***Instrumentation and Lab Assays***

- Measurement Instrumentation
- Microscopes
- Standard Lab Assays/Techniques
- Separation Techniques

20% ***Cell Techniques***

- Aseptic Techniques
- Microorganism Maintenance
- Transform Cells
- Maintain Animal Cells in Tissue Culture
- Clone Plants
- Determine the Viability of Cells in Culture

Written Exam Reference Materials (Reference Current Edition)

- **Biotechnology: Science for the New Millennium** by Ellyn Daugherty (Paradigm Publishing)
- **Biotechnology Lab Manual** by Ellyn Daugherty (Paradigm Publishing)
- **Biotechnology: A Laboratory Skill Course** by Kirk Brown (Bio-Rad Laboratories)

Materials Needed for the Written Exam

- A four-function calculator is included in the online testing system. No other calculators are permitted.
- Scrap paper and pencil/pen are permitted.

Written Exam Sample Items

Each question on the exam consists of one incomplete sentence or question followed by four choices. Some items reference an image or diagram. A few sample items are included below; the correct answer is designated with an asterisk (*).

Cells grown in an incubator are not dividing as fast as they normally would. The first step in troubleshooting would be to:

a. order new cells.
b. add water to the incubator.
c. replace CO2 tank.
d. check temperature of the incubator. (*)

An inverted microscope differs from a standard microscope because the:

a. objectives are located beneath the stage.
b. light source is located above the specimen.
c. microscope slide cannot be observed with a standard microscope.
d. both A and B. (*)

NOCTI Performance Exam

- Administration Time: 1 hours and 45 minutes
- NOCTI Criterion-Referenced Cut Score/Passing Score: 89.4%
- Administration Method: Onsite at a DESE approved Massachusetts Area Testing Center (MATC) location. Candidates must register and schedule their exam session through NOCTI.

Performance Exam Content Coverage

29% ***Colony Isolation Quadrant Streaking Bacteria Method***
Participant will use the equipment provided and streak bacteria using a quadrant streaking method, place agar plate in incubator, and ensure workstation is clean and ready for next laboratory session.

18% ***Using Volumetric Equipment: Micropipettes***
Participant will demonstrate good laboratory practices for both Step 1 and Step 2 to set micropipettes, choose the appropriate micropipette for each provided volume, provide each for evaluation, label centrifuge tube, set the appropriate micropipette to provided measurement, and ensure workstation is clean and ready for next session.

13% ***Using Volumetric Equipment: Serological Pipettes***
Participant will select from provided pipette pumps, and accurately pipette the stock solutions into labeled tubes, complete the table provided, and ensure that workstation is clean and ready for next laboratory session.

19% ***Making a Molar Solution***
Participant will use the materials provided to make the correct amount of solution showing calculation, prepare the NaCl solution, store in properly labeled container, and ensure workstation is clean and ready for next laboratory session.

21% ***Making a Serial Dilution***
Participant will use materials and equipment provided to make correct dilution, calculate final dilution, and ensure that workstation is clean and ready for next laboratory session.

Performance Exam Requirements

Candidate Supplied

Candidates must bring all appropriate Personal Protective Equipment (PPE), attire/uniform, and any other safety items routinely expected to be used by an employee in the related industry. If the candidate does not bring what is needed to safely complete all jobs on the exam as required in the workplace, the testing session will need to be rescheduled at the candidate's expense.

Site Supplied

Additional equipment and supplies needed to complete the jobs on the performance test will be provided by the testing site.

Performance Exam Site Requirements

Testing sites may have individual requirements based on location and any relevant and current guidance from the Center for Disease Control and Prevention (CDC).