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### 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

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**10% Fundamentals of Health & Safety and Refrigerant Regulations**

- Health and Safety Regulations and Practices
- Refrigerant Regulations

**5% HVAC & R Fundamentals and Refrigeration Principles**

**5% Pipe Joining Techniques**

- Identify and Install Piping, Fittings, and Materials
- Describe Brazing and Soldering Techniques

**20% Electrical Components and Wiring**

- Apply Principles of Electricity
- Install Electrical Controls and Systems

**30% Refrigeration Components and Systems**

- Troubleshoot and Install Refrigeration Components

**5% Installation and Service of Heating and Cooling Equipment**

- Install and Troubleshoot Air Conditioning and Heat Pump Equipment

**10% Installation and Service of Oil Heating and Systems**

- Install and Troubleshoot Oil Heating Equipment

**5% Installation and Service of Natural Liquid Petroleum Gas Equipment**

- Install and Troubleshoot Gas Heating Equipment

**5% Air Distribution and Indoor Air Quality**

- Describe Ventilation Applications and Forced-Air Duct Systems

**5% HVAC & R Related Mathematics**

- Estimation
- Use Formulas
- Convert Between Measurement Systems
- Solve Linear Equations
- Calculate Geometric Figures

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**Written Exam Reference Materials (Reference Current Edition)**

- **Refrigerant Transition and Recovery Certification Manual** by Air Conditioning Contractors of America (ACCA)
- **Modern Refrigeration and Air Conditioning** by Althouse, et al. (Delmar – ISBN #1-56637-300-X)
- **Refrigeration and Air Conditioning Technology** by Whitman and Johnson (Delmar – ISBN #0-8273-5646-3)

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**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.

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**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 (\*).

What percentage of a recovery (D.O.T.) cylinder can be safely filled with liquid refrigerant?

- a. 95%
- b. 70%
- c. 80% (\*)
- d. 90%

An oversized Thermostatic Expansion Valve (TEV) installed on an evaporator coil will create:

- a. a high superheat reading.
- b. a low superheat reading. (\*)
- c. a starved evaporator coil.
- d. excessive head pressure.

## NOCTI Performance Exam

- Administration Time: 3 hours
- NOCTI Criterion-Referenced Cut Score/Passing Score: 96.9%
- 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

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**34% Brazing or Soldering**

*Participant will use safety considerations to flare and braze a solder using a torch. Assemble pieces according to the figure shown and absence of leaks.*

**33% Refrigerant Recovery**

*Participant will calibrate manifold gauges, install and remove gauges properly and safely. Purge manifold gauge hoses, adjust/position service valves to read pressures. Recover and replace the correct amount of refrigerant and complete System Conditions Sheet for Job 2.*

**33% Gas Furnace Start-Up and Check-Out**

*Participant will test, verify, and adjust manifold gas pressure. Leak test gas connections, check electrical connections, measure and record unit supply voltage. Install thermostat, start equipment, test and adjust burner manifold pressure. Test temperature rise, check fan motor amperage draw, perform steady-state efficiency test, and calculate unit CFM.*

### Performance Exam Requirements

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#### Candidate Supplied

Candidates must bring all appropriate Personal Protective Equipment (PPE), attire/uniform, and any other safety items as is 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. PPE required, but not limited to:

- Work Gloves
- Safety Glasses

#### 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

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