

Job Ready Assessment Blueprint

HVACR-Service and Repair



Test Code: 2110 / Version: 01

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General Assessment Information

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Test Type: The HVACR-Service and Repair industry-based credential is included in NOCTI's Job Ready assessment battery. Job Ready assessments measure technical skills at the occupational level and include items which gauge factual and theoretical knowledge. Job Ready assessments typically offer both a written and performance component and can be used at the secondary and post-secondary levels. Job Ready assessments can be delivered in an online or paper/pencil format.

Revision Team: The assessment content is based on input from secondary, post-secondary, and business/industry representatives from the states of Connecticut, Mississippi, New Jersey, New York, Pennsylvania, and Tennessee.



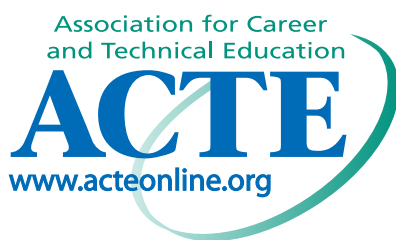
47.0201- Heating, Air Conditioning, Ventilation, and Refrigeration Maintenance Technology/Technician



Career Cluster 2- Architecture and Construction



49-9021.01- Heating and Air Conditioning Mechanics and Installers



The Association for Career and Technical Education (ACTE), the leading professional organization for career and technical educators, commends all students who participate in career and technical education programs and choose to validate their educational attainment through rigorous technical assessments. In taking this assessment you demonstrate to your school, your parents and guardians, your future employers and yourself that you understand the concepts and knowledge needed to succeed in the workplace. Good Luck!



North American Technician Excellence (NATE) is the nation's largest non-profit certification organization for heating, ventilation, air conditioning and refrigeration (HVACR) technicians. NATE is the only certification organization that was developed by, and supported by, the entire HVACR industry for nearly 20 years. NATE offers over 20 HVACR certificates and certifications that represent and validate a technician's real world working knowledge of HVACR systems. Students passing NOCTI assessments in the area of Secondary HVACR Installer and Start-up, and Secondary HVACR Service and Repair are prime candidates to enter today's workforce and achieve success earning NATE certifications in the future.



In the lower division baccalaureate/associate degree category, 3 semester hours in HVAC, Refrigeration, or General Technology.

Written Assessment

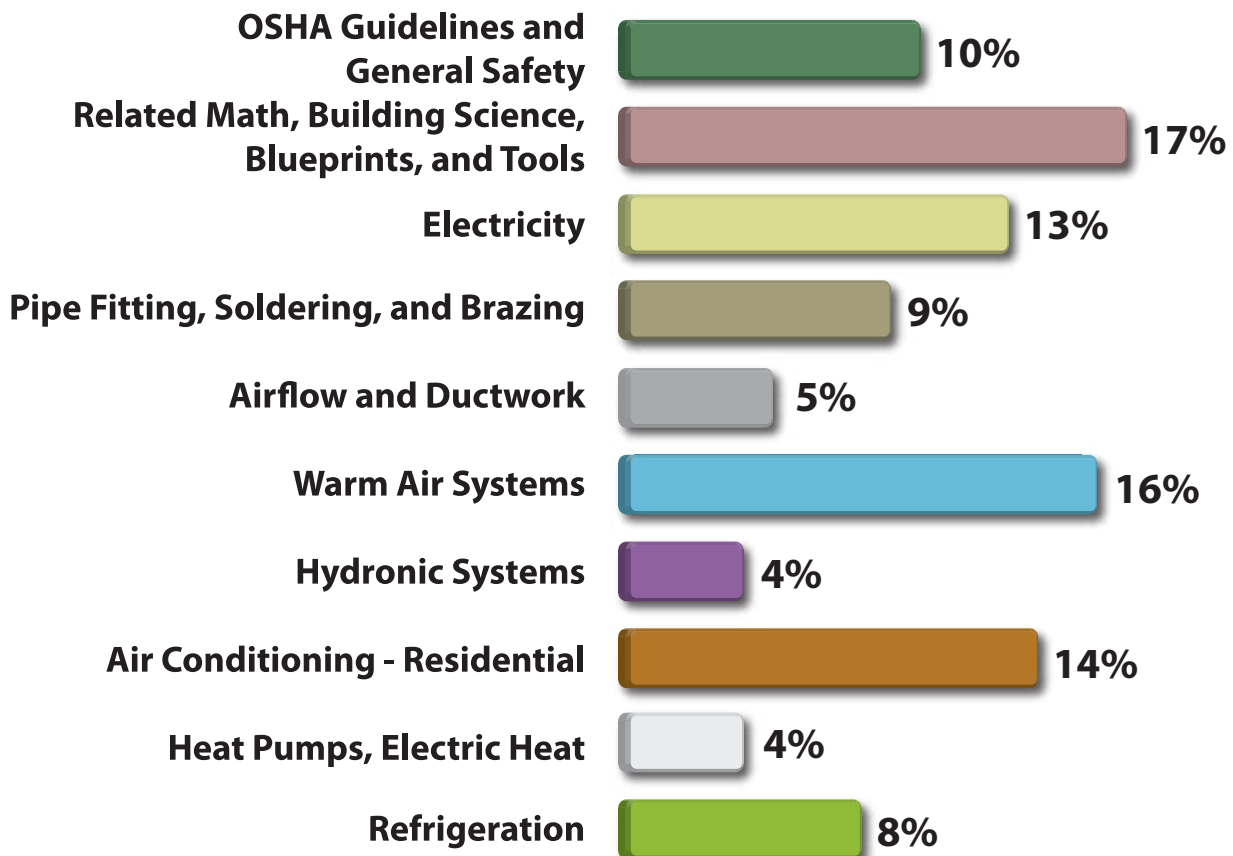
NOCTI written assessments consist of questions to measure an individual's factual theoretical knowledge.

Administration Time: 3 hours

Number of Questions: 138

Number of Sessions: This assessment may be administered in one, two, or three sessions.

Areas Covered



Specific Standards and Competencies Included in this Assessment

OSHA Guidelines and General Safety

- Apply personal and environmental safety procedures, including personal protective equipment (PPE)
- Demonstrate understanding of fire protection equipment and procedures
- Demonstrate knowledge of electrical safety procedures
- Demonstrate knowledge of HVAC-specific safety procedures

Related Math, Building Science, Blueprints, and Tools

- Demonstrate understanding of modes of heat transfer and British Thermal Unit (BTU)
- Measure with a ruler, correctly identify fractions
- Calculate GPM, CFM, and CFM per ton
- Understand the properties of air
- Accurately interpret blueprints and electrical diagrams
- Identify, use, and maintain hand and power tools

Electricity

- Demonstrate understanding of basic electrical theory and codes
- Exhibit knowledge of series and parallel circuits
- Troubleshoot, service, and repair various electrical circuits and components (thermostats, transformers, fuses, relays, etc.)
- Troubleshoot, service, and repair various motors and motor controls, including circuit protectors



(Continued on the following page)

Specific Standards and Competencies (continued)

Pipe Fitting, Soldering, and Brazing

- Solder and/or braze, and leak test tubings and fittings
- Set up and operate torch and equipment
- Properly use various pipe and tubing types and fittings

Airflow and Ductwork

- Maintain appropriate indoor air quality equipment (air cleaners, humidification, etc.)
- Measure temperature change, calculate CFM, and perform other system operation measurements

Warm Air Systems

- Demonstrate knowledge and understanding of sequence of operation
- Properly set up and adjust warm air equipment
- Install and size flues properly, adhering to appropriate gas codes
- Perform preventive maintenance procedures, including combustion analysis and calculating efficiency

Hydronic Systems

- Service and repair hydronic systems and components, including zone valves
- Troubleshoot hydronic operating pressures, water flow, and temperatures



(Continued on the following page)

Specific Standards and Competencies (continued)

Air Conditioning – Residential

- Identify refrigerants by pressure/temperature relationship and select appropriate refrigerants and oils
- Troubleshoot system components and metering devices
- Understand how to recover, pressure-test, evacuate, and charge an air conditioning system, according to the EPA 608 Clean Air Act

Heat Pumps, Electric Heat

- Troubleshoot and test proper operation of heat pumps, reversing valve, defrost controls, etc.
- Perform preventive maintenance procedures for heat pumps, including calculating system efficiency

Refrigeration

- Troubleshoot refrigerant components using proper testing procedures
- Describe various refrigeration system types and operations
- Service and repair defrost system controls and components

Sample Questions

Natural gas has

- A. an odor added to it, to make it detectable
- B. a natural odor of its own
- C. no chance of leaking into a boiler room
- D. a sweet, pleasant odor

Measure relative humidity with a

- A. barometer
- B. hydrometer
- C. psychrometer
- D. relativometer

When referring to wire size, the larger the gauge number, the

- A. larger the diameter of wire
- B. smaller the diameter of wire
- C. larger the ampacity
- D. thicker the insulation

When using oxyacetylene equipment, the operator should

- A. transport uncapped tanks
- B. secure the tanks
- C. avoid flashback arrestors
- D. oil the regulator

Water velocities in hydronic systems are measured in

- A. feet per second
- B. rotations per minute
- C. gallons per hour
- D. foot pounds

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Sample Questions (continued)

A service tech measures relative humidity with a

- A. barometer
- B. thermometer
- C. psychrometer
- D. velometer

A compressor's motor winding insulation is best checked with a/an

- A. ohmmeter
- B. voltmeter
- C. ammeter
- D. megaohmmeter

During the brazing operation, nitrogen is purged through ACR tubing to

- A. prevent an explosion
- B. prevent discoloration
- C. prevent oxidation
- D. provide tube washout

The control that shuts down a warm-air furnace when the plenum discharge temperature exceeds the design of the system is the

- A. system thermostat
- B. DIAP/RAM pressure switch
- C. safety high limit
- D. plenum fan switch

According to the Environmental Protection Agency (EPA), all manifold gauge assemblies must have _____ fittings.

- A. color-coded
- B. low-loss
- C. copper
- D. quick-release

Performance Assessment

NOCTI performance assessments allow individuals to demonstrate their acquired skills by completing actual jobs using the tools, materials, machines, and equipment related to the technical area.

Administration Time: 3 hours

Number of Jobs: 3

Areas Covered:

34% Troubleshoot and Repair Heat Pump

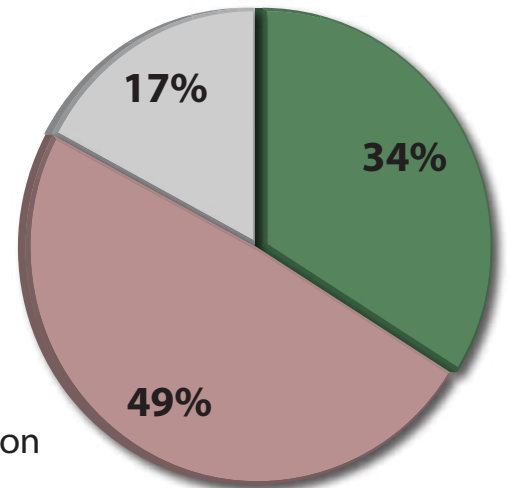
Participants will adjust and install manifold gauge set, start the unit, check operation and pressure, record measurement, identify the problem, explain the correction procedure, and correct the problem.

49% Pump Down Refrigeration System and Replace Liquid Line Filter Drier

Participants will install refrigeration manifold gauge set, start system and allow it to stabilize, front-seat the liquid line valve, monitor suction and discharge pressures, stop the compressor, relieve low-side pressure, remove and replace filter drier, evacuate isolated portion of system to atmosphere, return the system to full operation, purge de minimis amount of refrigerant, restart system, record readings, and clean up.

17% Locate an AC/R System Leak

Participants will attach a gauge set to system, locate the leak, demonstrate refrigerant recovery, and record readings.



Sample Job

Locate an AC/R System Leak

Maximum Time: 45 minutes

Participant Activity: The participant will attach gauges to system using the De minimis Rule, locate leak using provided leak detector tool, and demonstrate proper refrigerant recovery method.

