



Job Ready Assessment Blueprint

Heating, Ventilation, Air Conditioning & Refrigeration (HVAC/R)



Test Code: 3064 / Version: 01

“Measuring What Matters”

Specific Competencies and Skills Tested in this Assessment:

Electricity

- Demonstrate understanding of basic AC/DC theory
- Understand/use electrical formulas
- Interpret/construct electrical diagrams
- Understand series/parallel circuits
- Understand/use ohmmeters, voltmeters, and ammeters
- Identify/test various electrical components
- Apply/manipulate Ohm's Law
- Demonstrate knowledge of wiring exercises
- Perform troubleshooting
- Understand/test transformers
- Replace 3-phase motors (wire for high and low volts)
- Wire residential heat pump control circuits
- Test capacitors and calculate multiple capacitors
- Test fuses and calculate fuse size



Soldering, Brazing, and Welding

- Identify types of solder and alloys
- Choose proper flux for each alloy
- Understand soldering/brazing of tubings and fittings
- Use nitrogen or carbon dioxide when brazing
- Understand measurement taking
- Set-up/use of torch and equipment
- Demonstrate understanding of gas welder usage
- Understand leak check procedures
- Indicate melting temperatures



Specific Competencies and Skills continued:

Pipefitting

- Interpret drawings on blueprints
- Display knowledge of working with tubing and/or pipe
- Identify valves and fittings

Controls

- Differentiate types of metering valves
- Demonstrate knowledge of the function of a distributor
- Identify methods of defrosting refrigeration systems
- Identify/test/calibrate controls
- Demonstrate knowledge of thermostat installation
- Test motor starting relays

Installation and Service

- Identify/use appropriate hand and power tools
- Test, analyze, troubleshoot, and repair system
- Service motor components
- Service coolers (reach-in and walk-in)
- Demonstrate knowledge of code regulations



Related Math and Science

- Use temperature conversion scales
- Identify modes of heat transfer
- Demonstrate understanding of British Thermal Unit (BTU)
- Demonstrate understanding of compression ratio
- Measuring in increments
- Calculate GPM, CFM, and CFM per ton
- Calculate materials cost

Specific Competencies and Skills continued:

Refrigeration

- Identify refrigerant types for proper application
- Understand how to evacuate and charge a refrigeration system
- Service/troubleshoot refrigeration systems
- Size refrigerant lines
- Understand compressor operation
- Identify absorption and centrifugal system components
- Understand defrost procedures
- Measure superheat
- Understand refrigeration safety techniques

Refrigerant Recovery

- Define recovery, reclamation, and recycling
- Demonstrate knowledge of the Montreal Protocol
- Identify refrigerants by chemical family
- Properly handle/dispose of refrigerants



General Safety

- Demonstrate knowledge of basic first-aid skills and procedures
- Demonstrate knowledge of ladder safety
- Demonstrate knowledge of personal protective equipment (PPE)
- Identify/use fire extinguishers
- Demonstrate knowledge of electrical safety procedures
- Demonstrate knowledge of safe lifting techniques
- Demonstrate knowledge of correct handling and reporting of accidents
- Demonstrate knowledge of safe equipment repair practices
- Demonstrate knowledge of HVAC-specific safety procedures

Specific Competencies and Skills continued:

Computer Literacy

- Demonstrate basic understanding of common operating systems
- Demonstrate basic understanding of basic word processing procedures/techniques
- Identify/prepare basic spreadsheets
- Prepare/maintain basic database

Employability Skills

- Demonstrate understanding of resume and job interview skills
- Identify the components/requirements for effective oral presentations
- Demonstrate understanding of proposal and technical writing
- Demonstrate knowledge of organizational skills

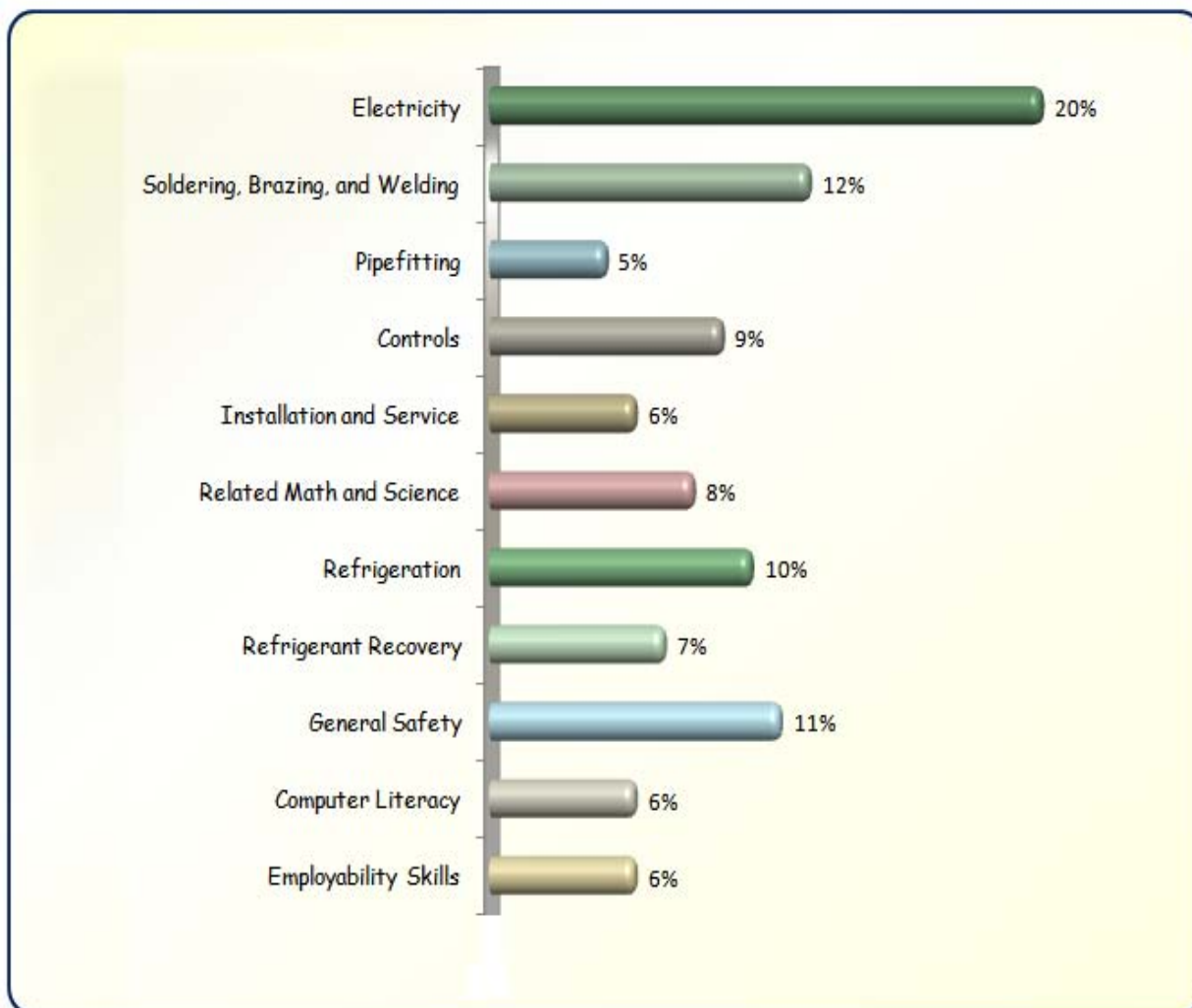


Written Assessment:

Administration Time: 3 hours

Number of Questions: 118

Areas Covered:



Sample Questions:

A heat pump changes from cooling to heating by

- A. a reversing valve
- B. compressor rotation
- C. heat application to the refrigerant
- D. de-energizing the outdoor fan

A 50/50 solder is a combination of lead and

- A. tin
- B. nickel
- C. antimony
- D. zinc

When calculating heat loss, the HTM means the

- A. heat temperature menu
- B. house thermal material
- C. heat transfer multiplier
- D. heating thermostat method

The refrigerant used in smaller centrifugal compressors is

- A. R-11
- B. R-12
- C. R-13
- D. R-22

If one of the distributor ports is plugged, the distributor will

- A. equally feed the extra refrigerant to all other ports
- B. feed unequal amounts of refrigerant to adjacent ports
- C. create flow problems for all other ports
- D. pulse, causing intermittent starving and flooding in the evaporator



Performance Assessment:

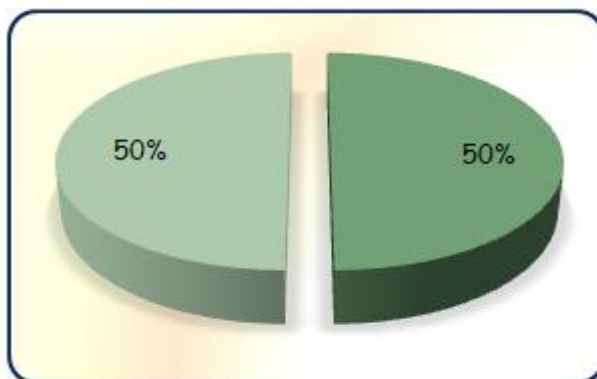
Administration Time: 3 hours

Number of Jobs: 2

Areas Covered:

50% **Gas Furnace Start-up and Check**

Evaluation of assigned order, leak test gas connections, test supply gas pressure, test electric connection for voltage and polarity, start equipment, adjust thermostat heat anticipator setting, test manifold gas pressure, test temperature rise through unit, check fan motor amperage draw, perform steady state efficiency test, complete system operation sheet, time to complete job.



50% **Refrigerant Recovery and System Recharge**

Evaluation of assigned order, adjust manifold gauges, install gauges, purge manifold gauge hoses, adjust/position service valves to read pressures, recover refrigerant, replace filter dryer and sight glass, vacuum system, install new refrigerant, restart system, check system operation, complete system conditions sheet, time to complete job.

Sample Job: Refrigerant Recovery and System

Maximum Time: 1 hour and 30 minutes

Participant Activity: The participant will perform refrigerant recovery and system recharge utilizing the vapor recovery method.



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!



The Pennsylvania Builder's Association utilizes this assessment to assist in determining competencies for granting skill certificates to students graduating from Pennsylvania secondary trade programs that have been endorsed by the Pennsylvania Builders Association (PBA).

PBA's services include support to workforce training and education by linking industry employers with educators to grow the workforce of tomorrow. PBA serves Pennsylvania communities and consumers through its steadfast efforts to protect homeownership rights and advocate for affordable housing options. PBA is affiliated with the National Association of Home Builders.