



Certifying the
finest in HVACR

Core Exam

KATE

Knowledge Areas of
Technician Expertise

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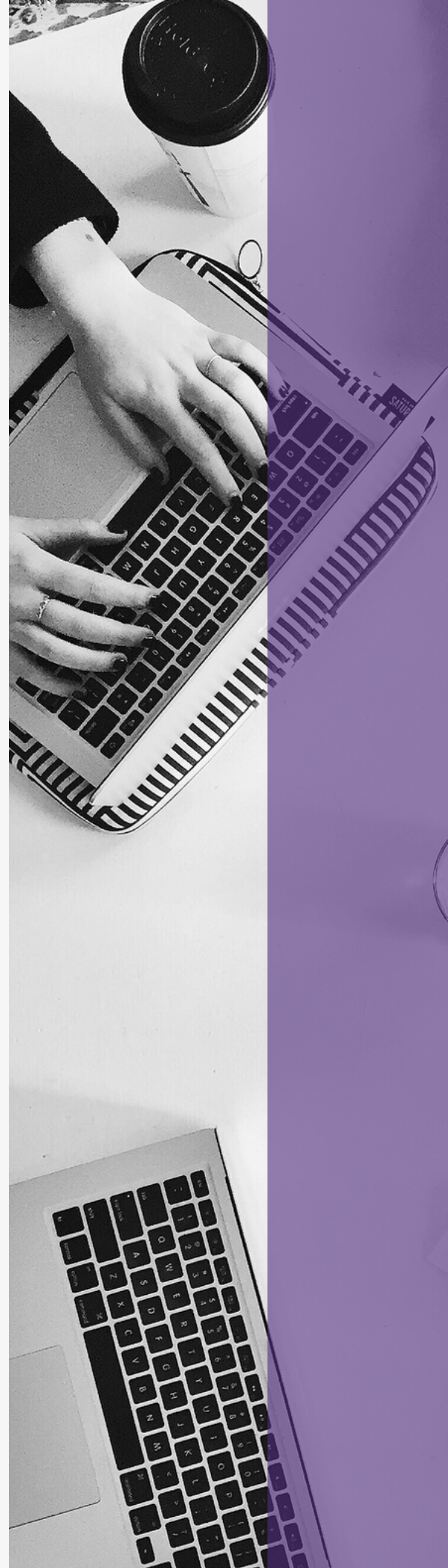
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NATE Core Exam



Exam Information & Qualifications

The Core Exam tests a candidate's general knowledge, construction knowledge, and HVACR specific knowledge in the areas of safety, tools, basic construction, basic science, achieving desired conditions, taking measurements, and basic electricity.

This exam is designed for technicians in the HVAC/R industry. This exam is a requirement for most installation or service specialty certifications.

Exam Copyrights

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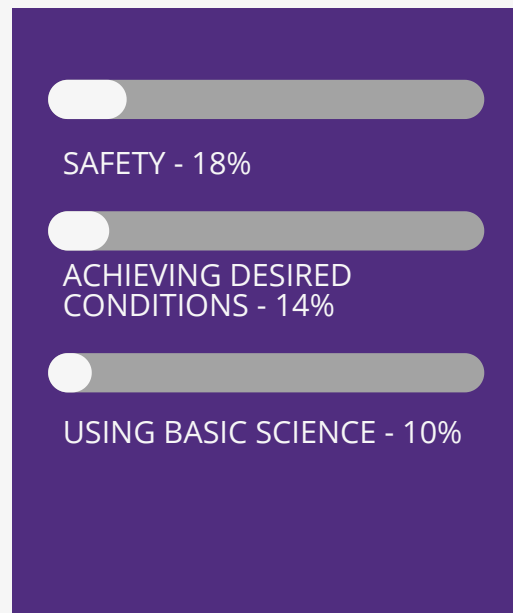
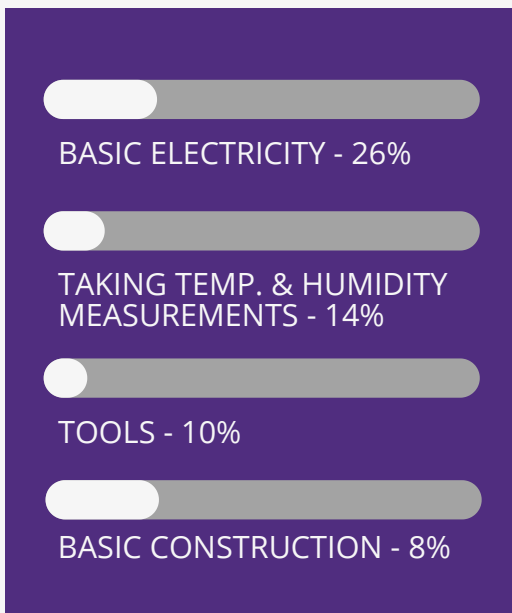
Passing Score Development Process



The passing scores for the NATE tests were established using a systematic procedure (a Passing Score Study). This procedure employed the judgment of experienced HVAC professionals and educators representing various HVAC specialties and geographical areas. The passing scores were set using criteria defining competent performance. The passing score for different test forms may vary slightly due to the comparative difficulty of the test questions.

Exam Subject Areas

Percentages of questions that will be in each section of the Core exam:



Exam Specifications:



Passing Score: Pass/Fail



1.5 Hour Time Limit



Closed Book



50 Questions

Industry References

The reference materials list below will be helpful in preparing for this exam. These materials may not contain all of the information necessary to be competent to pass the exam.



- American National Standards Institute (ANSI) / Air Conditioning
- Contractors of America (ACCA) Manuals – Latest Edition.
 - Manuals “D” “J” “QI” – Quality Installation, and “S”
- ACCA Manuals “T” and “RS” – Latest Editions
- ACCA Residential Duct Diagnostics and Repair – Latest Edition
- AHRI-Hydraulics Section – IBO/RAH – Latest Edition
- International Code Council – Latest Editions
 - Mechanical, Plumbing, Energy Conservation, and Residential
- ANSI//ASHRAE Standard- 152-2004 – Latest Edition with Addendum
- ENGERY STAR™ Home Sealing Standards – Latest Edition with Addendum
- Duct Calculators – Sheet Metal, Ductboard, and Flexible Duct
- American National Standards Institute (ANSI)/Sheet Metal and Air Conditioning Contractors’ National Association, Inc. (SMACNA) Manuals

References continue on next page

Industry References (continued)

- HVAC Duct Construction Standards –Metal and Flexible
- Sheet Metal and Air Conditioning Contractors’ National Association, Inc. (SMACNA) Manuals
 - Fibrous Glass Duct Construction Standards, Residential Comfort System Installation Standards Manual, and HVAC Air Duct Leakage Test Manual
- Air Diffusion Council Flexible Duct Performance & Installation Standards
- North American Insulation Manufacturers Association (NAIMA) Manuals
 - Fibrous Glass Duct Construction Standards and A Guide to Insulated Air Duct Systems
- International Fuel Gas Code – Latest Edition with Addendum
- National Fuel Gas Code – Latest Edition with Addendum
- Generally accepted HVACR textbooks
- Generally accepted construction textbooks
- OSHA safety standards
- National Fire Protection Association – Latest Editions
 - Gas, Oil, and Electric



KATES

Knowledge Areas of Technician Expertise

All NATE exams are based on Knowledge Areas of Technician Expertise (KATES), statistically proven job task analysis from experts in the HVACR industry. This KATES outline covers all information tested in the **Core Exam** and should be used as reference material.

Safety

- Complying with Government Regulations
 - Transportation regulations for hazardous materials
 - Health and safety regs for hazardous materials
 - Environmental regs for hazardous materials
- Personal Safety and Work Practices
 - Regs concerning confined spaces, hard hats, etc.
 - Safety with hand tools
 - Using ladders and scaffolds
 - Refrigerant in confined spaces
 - Safe driving practices
 - Clothing, safety equipment, and hard hats
 - Safety glasses
 - Hearing protection
 - Safe practices in repair
 - Using warning symbols
 - Safe handling of hazardous materials
 - Safety within confined spaces
 - Safe practices in troubleshooting and repair
- Personal Safety Around Moving Machinery
 - Blowers
 - Pulleys
 - Clothing requirements
 - Condenser fans
- Electrical Safety
 - Overview of electrical safety
 - Grounding-GFI requirements outdoor extension cords
 - Personal protection

KATES

Knowledge Areas of
Technician Expertise

Safety (continued)

- Safe Brazing and Soldering Practices
 - Overview of safety
 - Oxygen and acetylene safety
 - Using purging gases-Nitrogen, Carbon Dioxide, etc
 - Fire extinguishers
 - Documentation for hazardous materials - MSDS
- Safe Handling of Containers
 - Disposal
 - Securing containers for transport
 - Signage and documentation for containers
 - Proper storage
 - Proper container filling
- Understanding Hazmat
 - Signage for hazardous materials
 - Securing hazardous materials for transport
 - Documentation for hazardous materials - MSDS
 - Worker requirements for HAZMAT training

Tools

- Tools & Scales - Basic Math Measurement
 - Rulers, compass, square, protractor, etc.
 - Improvised measuring techniques
 - Basic scale drawings
 - Measurements - inches, feet, centimeters, millimeters, etc.
Understanding tolerances

KATES

Knowledge Areas of
Technician Expertise

Tools (continued)

- Fabrication Tools
 - Screwdrivers and nut drivers
 - Wrenches, pliers, and allen wrenches
 - Socket sets
 - Levels and squares
 - Tool maintenance and care
 - Saws and files
 - Drills, countersink, reamers, and bits
 - Punches, taps, and dies
 - Hammers Metal tools - metal snips, sheers, benders, breaks, hand formers, calipers, rulers, stapler, etc.
- Tubing Tools
 - Benders - spring, lever, etc.
 - Flaring tools
 - Tube cutters
 - Swaging tools
 - Reamers

Basic Construction

- Plans and Specifications
 - Construction
 - Materials
 - Layout
- Plumbing (Piping) Layouts
 - Construction
 - Materials
 - Layout
- Room Specs - Clear Span & Ceiling Heights
 - Construction
 - Materials
 - Layout

KATES

Knowledge Areas of
Technician Expertise

Basic Construction (continued)

- Roofing
 - Construction
 - Materials
 - Layout
- Ceilings
 - Construction
 - Materials
 - Layout
- Walls
 - Construction
 - Materials
 - Layout
- Floors
 - Construction
 - Materials
 - Layout
- Fenestration
 - Construction
 - Materials
 - Layout
- Girders & Trusses
 - Construction
 - Materials
 - Layout
- Chimneys
 - Construction
 - Materials
 - Layout

KATES

Knowledge Areas of
Technician Expertise

Using Basic Science

- Chemistry Basics
 - Properties of matter
 - How chemicals react with each other
 - Role of chemistry at the jobsite
 - Oxidation and combustion
 - Weight and density of materials
- Electrons in Electricity
 - Fundamental electrical concepts
 - Electrical charge
 - Conductors
 - Insulators
 - Dielectrics
- Electrical Basic Terms
 - Voltage
 - Amps - milliamps, microamps, etc.
 - Resistance - Ohm's, megohms, etc.
 - Power - watts
- Magnetism
 - Magnetic principles in electricity
 - Magnetic components - coils
 - Magnetic components - transformer
- AC and DC Circuits
 - Simple DC circuit
 - Basic control and loads
 - Polarity
 - Ohm's Law in DC circuits
 - Introduction to AC circuits
 - Effects of AC on controls and loads

KATES

Knowledge Areas of Technician Expertise

Using Basic Science (continued)

- Basic Circuit Analysis
 - Difference between AC & DC power
 - Series circuits
 - Parallel circuits
 - Ohm's Law
 - Current distribution in multiple load circuits
 - Complex circuits
- Electricity - Generation and Distribution
 - Intro to electrical distribution
 - Transformer distribution
 - Impact of available electrical power on equipment
- Solid State Electronics
 - Introduction to basic solid state components
 - Overview of solid state devices in HVAC
 - Solid state sensing devices
 - Introduction to basic solid state components
 - Fundamental solid state circuits
- Pressure Measurements
 - Overview of pressure systems
 - Pressure laws and pressure measurement terminology
 - Temperature vs. Pressure
 - Gas laws
- Mathematics
 - Arithmetic
 - Whole numbers - add, subtract, multiply and divide
 - Fractions - add, subtract, multiply and divide
 - Decimals - add, subtract, multiply and divide
 - Percentages, ratios, and proportions
 - Rounding off of values
 - Interpolation Calculators
 - Combined calculations
 - Mixed numbers
 - Conversion of number forms
 - Using sequences and series to predict results

KATES

Knowledge Areas of Technician Expertise

Using Basic Science (continued)

- Algebra
 - Basic linear single variable equations
 - Using basic algebra in problem solving
 - Transposing formulas
- Geometry
 - Geometric figures used in HVAC - points, lines, rectangles, parallelograms, rhombuses, squares, trapezoids, etc.
 - Units of measurement. Typical computations using geometry. The right triangle. 30-60-90, 45-45-90.
 - Parallels and perpendiculars
 - Concepts of three-dimensional figures.
 - Drawing three-dimensional objects.
 - Computations with three-dimensional shapes.
 - Estimating areas, perimeters, and volumes of irregular figures
- Graphs, Charts & Tables
 - Introduction to basic graphs, plots, and tabular data
 - Graphs and tables used in instruction sheets
 - Blueprint reading
- Mechanics
 - Simple machines - levers, gears, etc.
 - Conservation of energy
 - Complex machines - how mechanisms work
 - Basics of fluid mechanics
- Gas Laws
 - Gas laws
- Electrical Load Types
 - Capacitive - momentary and continuous
 - Inductive - momentary and continuous
 - Resistive - momentary and continuous
 - Power Electrical power formulae - conversion of power
 - Introduction to power factor

KATES

Knowledge Areas of
Technician Expertise

Achieving Desired Conditions

- Temperature
 - Role of temperature in comfort
 - Regional temperature considerations and comfort
- Humidity
 - Role of humidity in comfort
 - Adjusting system performance for humidity control
- Air Quality
 - Ventilation -comfort
 - Air cleaning for comfort
 - Ventilation - comfort
 - Odor control
- Sound
 - Equipment source
 - Airflow source
 - Equipment
 - Airflow

Taking Temp. & Humidity Measurements

- Physical Measurements - Temperature & Heat
 - Latent heat
 - Sensible heat
 - Temperature
 - Fundamentals of humidity
 - Convection
 - Conduction
 - Radiation
 - BTU - Definition and use

KATES Knowledge Areas of Technician Expertise

Taking Temp. & Humidity Measurements (continued)

- Thermometers
 - Liquid column thermometers
 - Mechanical thermometers
 - Electronic thermometers
 - Infrared thermometers
 - Gauge / meter calibration
 - Recording thermometers - digital and analog
 - Dry bulb and wet bulb Delta T
- Humidity Measurement and Calculations
 - Sling psychrometer
 - Wet and dry bulb thermometers
 - Electronic humidity measurement
 - Gauge / meter calibration
 - Using psychrometric chart
 - Humidity probes attachments for use with meters
 - Enthalpy

Basic Electricity

- Symbols
 - Introduction to basic symbols
 - Use of symbols in diagrams
 - Symbol standards
- Field Wiring Diagrams
 - Basics of field diagram layout
 - Use of field diagrams
- Pictorial Diagrams
 - Basics of pictorial diagram layouts
 - Use of pictorial diagrams

KATES

Knowledge Areas of Technician Expertise

Basic Electricity (continued)

- Schematic (Ladder) Diagrams
 - Basics of schematic (ladder) diagram layouts
 - Reading schematics for determining sequences
 - Reading schematics for wiring connections
- Single Phase Motors
 - Types
 - Components
 - Operating principles
 - Torque characteristics
 - Tapped multi-speed
 - Selecting single phase motors
- Three Phase Motors
 - Types
 - Rotation
 - Components
 - Operating principles
 - Selecting multi-phase motors
 - Torque characteristics
- Variable Speed Motors
 - Variable speed motors - ECM, BPM, and VSIM
- Actuator Motors
 - Overview of damper motors
 - Dual position
 - Proportional
- Digital Electrical Meters
 - Identify meters and instruments
 - Digital electrical meters - use and setups
 - Voltage measurements
 - Resistance measurements
 - Amperage measurements
 - Use with temperature probes
 - Meter calibration and maintenance
 - RMS - correction and meter types
 - Millivolt measurements
 - Milliampere measurements