

Name _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

- 1) The first air conditioning system was patented in 1844 by: 1) _____
A) Benjamin Franklin. B) John Gorrie.
C) Thomas Edison. D) Willis Carrier.
- 2) Producing ice began over 3,000 years ago using the: 2) _____
A) Water evaporation method. B) Distillation method.
C) Pressure-temperature method. D) Mechanical vaporization method.
- 3) The majority of refrigeration systems used for domestic, commercial, and industrial applications are: 3) _____
A) Mechanical vapor condensing systems. B) Mechanical vapor compression systems.
C) Condensing heat pump systems. D) Centrifugal vapor condensing systems.
- 4) Most consumption of electricity and natural gas is used for: 4) _____
A) Military operations. B) Heating and cooling.
C) Commercial and industrial lighting. D) Residential lighting.
- 5) Residential central heating and cooling systems became popular in: 5) _____
A) The late 60s. B) The late 50s. C) The late 70s. D) The mid 70s.
- 6) The United States Congress passed the Clean Air Act in: 6) _____
A) 2000. B) 1994. C) 1990. D) 1995.
- 7) Why is the capacity of air conditioning units stated in tons? 7) _____
A) Ton is an acronym for "total output nominal" rating
B) Because early cooling used tons of ice
C) Air conditioners are not rated in tons
D) Because the unit capacity is directly related to its weight
- 8) Who is often cited as the father of modern air conditioning? 8) _____
A) Willis Carrier B) Dave Lennox C) David Skaves D) John Gorrie
- 9) For a building to be properly ventilated: 9) _____
A) A vent hole must be installed in the center of a building space.
B) Air must be ducted from the floor to the ceiling.
C) Air must be able to flow and exchange properly throughout the building space.
D) Vents should always be installed from the sides of a building structure.
- 10) The difference between residential heating and cooling systems and commercial/industrial heating, cooling, or refrigerating facilities is: 10) _____
A) The number of people that occupy the building or facility.
B) The amount of energy the building or facility uses.
C) The size of the building or facility.
D) Whether the equipment or system is in a home or in a business.

- 11) In the modern refrigeration cycle, the compressor: 11) _____
A) Pumps low-pressure, low-temperature vapor to high-pressure, high-temperature vapor.
B) Transfers heat to the outdoor air.
C) Reduces the pressure of the liquid from the condenser to the evaporator.
D) Increases the pressure of the liquid refrigerant so that it will circulate through the system.
- 12) Environmental heating and air conditioning refers to: 12) _____
A) Cooling and heating homes and offices.
B) Cooling the air, food products, and industrial machinery.
C) Controlling air temperature, humidity, circulation, and cleanliness.
D) Managing the air outside by reducing toxins and pollutants.
- 13) Which method of freezing preserves the quality and taste of food? 13) _____
A) Any speed is fine because frozen is frozen.
B) The speed is determined by dividing the weight by the specific gravity of the food.
C) Slow, natural freezing
D) Quick freezing
- 14) Why does food that is frozen quickly taste better than food that is frozen slowly? 14) _____
A) Larger ice crystals are formed. B) Smaller ice crystals are formed.
C) Adiabatic rehydration D) Molecular recombination
- 15) Who developed the quick freezing process for preserving food? 15) _____
A) Clarence Birdseye B) Carter Stanfield
C) Dave Lennox D) Willis Carrier
- 16) Freezing food slowly: 16) _____
A) Preserves the food's nutritious value.
B) Was developed by Clarence Birdseye.
C) Forms large ice crystals that break the cell walls of the food.
D) Preserves the food's taste.
- 17) What type of HVAC work often requires a criminal background check? 17) _____
A) System installation helper B) Duct installation technicians
C) Industrial service technician D) Service work in people's homes
- 18) Why do many HVACR jobs now require a criminal background check? 18) _____
A) To determine what your social security number and address are
B) To protect the public from dangerous individuals
C) To assess potential job applicant's mechanical abilities
D) To look for a job applicant's high school grades
- 19) Which job would most likely not be open to a technician with a criminal background? 19) _____
A) Residential service technician B) Systems designer
C) New construction installation technician D) Commercial installation technician
- 20) Refrigeration refers to space temperatures: 20) _____
A) Below 60°F. B) Below 40°F. C) Below 0°F. D) Below 32°F.

- 21) The main divisions of the HVACR industry include: 21) _____
A) Air conditioning, heating, or refrigerating industrial building structures.
B) Cooling, heating, ventilating, or refrigerating specific spaces.
C) Ventilating and cooling commercial building structures.
D) Heating and cooling residential building structures.
- 22) Residential heating systems typically range from: 22) _____
A) 50,000 BTUs to 150,000 BTUs. B) 75,000 BTUs to 200,000 BTUs.
C) 100,000 BTUs to 120,000 BTUs. D) 75,000 BTUs to 125,000 BTUs.
- 23) Commercial central heating and cooling systems refer to: 23) _____
A) Single- to three-story office buildings only.
B) Single-story office buildings only.
C) Structures used for businesses in general.
D) Retail shopping malls only.
- 24) Commercial and industrial refrigeration systems: 24) _____
A) Are used only in supermarkets.
B) Are only used in production facilities.
C) Use three-phase equipment only.
D) Refer to retail food and cold-storage equipment and facilities.

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

- 25) Match the trade organization in the second column with its constituency in the first column. 25) _____
A. refrigeration service technician
B. HVACR manufacturers
C. HVACR engineers
D. HVACR contractors
1. AHRI
2. ASHRAE
3. RSES
4. ACCA

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

- 26) HVACR technicians must be certified by: 26) _____
A) An Environmental Protection Agency (EPA) certified testing organization.
B) The American Society of Heating, Refrigeration, and Air.
C) The Air Conditioning, Heating, and Refrigeration Institute (AHRI).
D) The American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE).
- 27) What does AHRI do? 27) _____
A) They write most government mechanical and electrical codes.
B) They represent over 90% of the HVACR manufacturers.
C) They are an organization devoted to educating HVACR technicians.
D) They are dedicated to engineering of HVACR systems and application.

- 28) Who is RSES? 28) _____
A) They represent over 90% of the HVACR manufacturers.
B) They are dedicated to engineering of HVACR systems and application.
C) They write most government mechanical and electrical codes.
D) They are an organization devoted to educating HVACR technicians.
- 29) Many HVACR industry publications are published by: 29) _____
A) The federal government. B) Local state governments.
C) HVACR industry trade groups. D) Fox News and CNN.
- 30) Popular HVACR publications include: 30) _____
A) Let's Cool Georgia.
B) Maine Maritime Mechanical Press.
C) The Federal Register.
D) The Air Conditioning, Heating and Refrigeration News.
- 31) Why should technicians read industry periodicals and publications? 31) _____
A) To find coupons for local grocery stores
B) To stay informed about the latest HVACR technology
C) Most certifications require an hour of journal reading a week
D) To practice reading because technicians don't read much
- 32) The difference between codes and standards is: 32) _____
A) Codes and standards apply to equipment that is sold on international markets.
B) Codes apply to local municipal laws and standards apply to state laws.
C) Codes are federally enforceable by law and standards are not.
D) Codes apply only to city and county building regulations.
- 33) HVAC Excellence: 33) _____
A) Established an organization to provide programmatic accreditation for HVAC programs.
B) Oversees national curriculum standards for all trade and technical education organizations.
C) Regulates all HVACR manufacturing facilities in the United States.
D) Provides a list of mechanical manufacturing codes for the HVAC industry.
- 34) Members of CARE include: 34) _____
A) The brightest students and instructors involved in national HVACR training programs.
B) Only contractors, wholesale corporations, and manufacturers in the HVACR industry.
C) Educational institutions that give the ICE.
D) Instructors, administrators, counselors, or organizations involved in HVACR training.
- 35) The Council of Air Conditioning and Refrigeration Educators (CARE): 35) _____
A) Issues a list of approved NATE and ICE testing centers.
B) Approves course content taught by HVACR secondary and post-secondary trade schools.
C) Provides a list of approved textbooks and study materials for HVACR secondary and post-secondary training programs.
D) Promotes best educational practices for HVACR schools to meet or exceed the needs of the industry.

- 36) Skills USA sponsors: 36) _____
- A) HVACR industry trade publications.
 - B) Financially challenged students with educational grants to attend post-secondary trade schools.
 - C) International competitions in fundamental skill areas for students attending trade and technical schools.
 - D) National competitions in journey-level skill areas, including bidding and estimating HVACR systems.
- 37) Skills USA is: 37) _____
- A) A regulatory agency that evaluates levels of competency for trade and technical schools.
 - B) A vocational institution that evaluates the skill level for HVACR technicians.
 - C) A national HVACR programmatic accrediting organization.
 - D) A vocational club for high schools, trade schools, and community colleges.
- 38) Many national and international trade associations have trade shows primarily to: 38) _____
- A) Use them as opportunities to sell tools and service training literature to technicians.
 - B) Display the most current innovations in equipment, tools, and service.
 - C) Entice technicians to join their associations.
 - D) Provide employment for HVACR technicians.
- 39) HVACR technicians should consider becoming involved in a trade association or with a student educational organization: 39) _____
- A) Because it will guarantee higher income.
 - B) To ensure that they can pass required industry certifications.
 - C) To develop business and technical contacts in the local HVACR industry.
 - D) To secure a Contractor's license.
- 40) Which of the following areas is NOT a NATE certification specialty? 40) _____
- A) Oil furnaces
 - B) Commercial Refrigeration
 - C) Transport Refrigeration
 - D) Air Conditioning
- 41) All NATE specialties are offered at two levels. They are: 41) _____
- A) Heating and air conditioning.
 - B) Apprentice and journeyman.
 - C) Journeyman and master.
 - D) Installation and service.
- 42) Select the NATE specialty test areas. You may select more than one. 42) _____
- A) HVAC Efficiency Analyst
 - B) Air Distribution
 - C) Domestic Appliances
 - D) Oil Furnaces
 - E) Electric Furnaces
 - F) Air Conditioning
 - G) Gas Furnaces
 - H) Transport Refrigeration
- 43) Who is the ICE exam designed for? 43) _____
- A) Students ready to enter the HVACR field
 - B) Technicians working on ice machines
 - C) Any HVACR service technician
 - D) The general public

- 44) What benefit is there to the student in taking the ICE exam? 44) _____
A) Students that pass are admitted into the ICE institute.
B) Students that pass can exempt one class in an HVACR program.
C) Enhanced job opportunity
D) Successful completion of the ICE exempts you from taking the EPA Certification exam.
- 45) The three types of ICE exam that a student may take include: 45) _____
A) Residential, Commercial, and Industrial.
B) Residential Heating and Air Conditioning, Commercial Heating and Air Conditioning, and Industrial Process Refrigeration.
C) Heating, Air conditioning, and Air Movement.
D) Residential Heating and Air Conditioning, Light Commercial Heating and Air Conditioning, and Commercial Refrigeration.
- 46) Upon the completion of the ICE exam: 46) _____
A) The names of all the successful participants are published.
B) The names of all the participants and whether or not they passed are published.
C) The names of the unsuccessful participants are published.
D) The names of all participants and their scores are published.
- 47) Refrigeration refers to space temperatures: 47) _____
A) Below 32°F. B) Below 40°F. C) Below 0°F. D) Below 60°F.
- 48) The main divisions of the HVACR industry include: 48) _____
A) Ventilating and cooling commercial building structures.
B) Cooling, heating, ventilating, or refrigerating specific spaces.
C) Air conditioning, heating, or refrigerating industrial building structures.
D) Heating and cooling residential building structures.
- 49) Residential heating systems typically range from: 49) _____
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- 50) Commercial central heating and cooling systems refer to: 50) _____
A) Retail shopping malls only.
B) Structures used for businesses in general.
C) Single- to three-story office buildings only.
D) Single-story office buildings only.
- 51) Commercial and industrial refrigeration systems: 51) _____
A) Use three-phase equipment only.
B) Are used only in supermarkets.
C) Refer to retail food and cold-storage equipment and facilities.
D) Are only used in production facilities.
- 52) When should you approach the customer about the potential cost of a required part? 52) _____
A) You should let them find out when they receive the bill.
B) Just before you leave the job
C) Before replacing the part
D) On the phone after you have left

- 53) What is one of the primary complaints that customers have about service technicians? 53) _____
A) Using off brand replacement parts B) Talking too much
C) Not talking enough D) Not arriving when they were expected
- 54) Explaining to the customer that the previous technician was obviously trying to cheat them: 54) _____
A) Is required by the National Service Technician's Code of Conduct.
B) Is only appropriate if the technician worked for another company.
C) Is never a good idea.
D) Will make the customer feel more trusting of you and your honesty.
- 55) Upon completion of the job, you should: 55) _____
A) Tell the customer how much they owe you and ask for your money.
B) Leave and send the customer a bill later.
C) Tell the customer what services were performed and ask for your money.
D) Tell the customer what services were performed and provide a clear and legible written invoice.
- 56) Why are all HVACR tradesmen advised to enroll in an approved safety-training program? 56) _____
A) It is required by ANSI.
B) It is required by OSHA.
C) Quick and proper treatment of injuries can result in less pain and possibly save lives.
D) It is required by law for all tradesmen that belong to a union.
- 57) Who is primarily responsible for the technician's safety? 57) _____
A) OSHA to familiarize employees with safety data concerning hazardous materials.
B) The employer to ensure that all employees be familiar with safety data concerning hazardous materials.
C) The state to ensure that all employees in the workplace are familiar with safety data concerning hazardous materials.
D) The employee to familiarize himself/herself with safety information regarding the workplace.
- 58) While materials that contain asbestos are processed, shaped, or cut: 58) _____
A) An exhaust blower system using a 5% efficient filter must be operating.
B) An exhaust blower system using a 50% efficient filter must be operating.
C) An exhaust blower system using a 7% efficient filter must be operating.
D) An exhaust blower system using a HEPA filter must be operating.
- 59) Safety protection should be worn: 59) _____
A) When working with liquids, vapors, or solid objects that are extremely hot or cold.
B) At all times when performing any work that requires PPE.
C) When working with power tools.
D) When handling refrigerant cylinders.
- 60) How should accidents be reported to the company office? 60) _____
A) An accident report form should be filled out and turned into the company office.
B) A privacy report form should be filled out and turned into the company office.
C) A medical report form should be filled out and turned into the company office.
D) A progress report form should be filled out and turned into the company office.

- 61) How can maintaining an orderly shop be beneficial? 61) _____
A) Less time is wasted searching for required tools or materials.
B) There is more frustration when searching for required tools or materials.
C) There is less productivity when using required tools or materials.
D) Less time is spent using required tools or materials.
- 62) When working in a confined space where concentrations of harmful substances are very high, why should atmosphere-supplying respirators be worn? 62) _____
A) To purify air of harmful dust, mist, metal, fumes, and vapors
B) To circulate odorless, tasteless, invisible refrigerants
C) To enable asphyxiation to occur in a very short time
D) To supply clean breathing air from a compressed air source
- 63) How can you easily maintain MSDS documents? 63) _____
A) Alphabetize the MSDSs by active ingredient.
B) Log all of the MSDSs in a computer system.
C) Throw the MSDSs in a box and put it in a closet.
D) Put MSDSs in a manilla envelope within the service vehicle.
- 64) When should you read the MSDS for a particular chemical product? 64) _____
A) In the event of any injury causing accidents
B) Immediately after exposure to the product
C) Before using the product
D) After completing the job
- 65) How can you determine what PPE should be used with any particular chemical product? 65) _____
A) Ask another worker. B) Call the EPA.
C) Ask the foreman. D) Read the MSDS form for that product.
- 66) Information that is required on an MSDS includes (you may select more than one): 66) _____
A) Flammability
B) Identity of the Chemical
C) Hazardous Ingredients
D) Physical and Chemical Properties
E) Manufacturing Date
F) Emergency Contact Information
G) Instructions for Use
- 67) When working with tools, a safety procedure to follow is to: 67) _____
A) Always read the manufacturer's instructions.
B) Read the warranty information.
C) Check where the tool was manufactured regarding quality.
D) Make sure the tools belong to you.
- 68) Why should tools only be used for the job they were intended to perform? 68) _____
A) They have not been tested for safety for jobs they were not designed for.
B) The tool manufacturer may sue you for improper tool use.
C) The tool manufacturer's can take your tools back if you violate the terms of use agreement.
D) Jobs are billed by the number of tools used.

- 69) When using portable electric tools with metal cases, you should: 69) _____
A) Lubricate the tool plug before plugging it in.
B) Always use a GFCI receptacle or GFCI adapter.
C) Always make sure you are well grounded.
D) Use as long an extension cord as possible.
- 70) Before changing the blade in an electric circular saw, you should: 70) _____
A) Put on heavy gloves.
B) Place a screwdriver down in the motor section to prevent the saw from starting.
C) Unplug the saw.
D) Work quickly to reduce the chance of the saw starting.
- 71) Select safe tool practices. You may select more than one. 71) _____
A) Always ground yourself when working around electricity
B) Arrange your tools around you in a convenient pattern on the floor
C) Keep tools sharp and clean
D) Do not work with tools in the dark
E) Wear thick gloves when working in the dark
F) Use correct fitting wrenches
- 72) The base of an extension ladder that is correctly set up will be: 72) _____
A) The same distance away from the wall as the height of the ladder.
B) As close to vertical as possible.
C) 1 foot from the wall for every 4 feet in length.
D) Exactly 3 feet from the wall.
- 73) The top of an extension ladder: 73) _____
A) Flush with the edge of the roof.
B) At least 12 inches below the point where it rests on the building.
C) At least 12 inches above the point where it rests on the building.
D) Should extend at least 36 inches above the point where it rests on the building.
- 74) How can a confined space, such as a walk-in cooler or underground tunnel become a safety hazard? 74) _____
A) The oxygen is limited; long exposure can cause suffocation.
B) Cell phones do not receive service in confined spaces.
C) Electricity flows more readily in a confined space.
D) The nitrogen can combine with carbon dioxide to form a toxic gas.
- 75) When entering a confined space: 75) _____
A) You should take a radio or cell phone for emergency calls in case you pass out.
B) You should leave a note at the entry point.
C) Another worker should be posted outside the confined space.
D) You should wear clothes that are resistant to spontaneous arcing.
- 76) Select safe shop practices. You may select more than one. 76) _____
A) Store oily shop towels in metal waste containers
B) Store face shield by grinding equipment
C) Make sure any tools left on the floor are easily visible
D) Wipe up liquid spills at the end of every week
E) Keep walking aisles clear of parts and tools

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

77) Match the fire extinguisher class in the second column with the type of fire in the first column. 77) _____

- A. Combustible metals
- B. Flammable liquids
- C. Ordinary combustible
- D. Electrical fires

- 1. Class A
- 2. Class B
- 3. Class C
- 4. Class D

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

78) One fire extinguisher in a work area is sufficient: 78) _____
A) If its capacity is large enough to handle a fire that could occur.
B) As long as it is the right class.
C) Providing it is capable of extinguishing class A, B, C, and D fires.
D) When water is accessible in a work area.

79) How is size of an extinguisher related to its ability to put out a fire? 79) _____
A) The fewer combustible materials, the newer the extinguisher.
B) The fewer combustible materials, the bigger the extinguisher.
C) The more combustible materials, the bigger the extinguisher.
D) The more combustible materials, the smaller the extinguisher.

80) To avoid electrical shock, what class fire extinguisher should be used on electrical equipment? 80) _____
A) Class A B) Class B C) Class C D) Class D

81) What class fire extinguisher should be used to safely extinguish a flammable liquid? 81) _____
A) Class A B) Class B C) Class C D) Class D

82) Select the lifting techniques that will reduce the possibility of injury from lifting a heavy item? 82) _____
Select all that apply.
A) Lift slowly
B) Keep your knees as straight as possible
C) Keep the load close to your body
D) Keep your back as straight as possible
E) Use your leg muscles to do the work
F) Use your back muscles to do the work
G) Lift quickly

83) Why should oil or grease never be used to lubricate oxygen or acetylene regulators? 83) _____
A) It can result in valve damage due to corrosion.
B) It will result in the loss of the manufacturer's warranty.
C) It can react with certain chemicals or materials and result in an explosion.
D) It decreases the accuracy of the gauges.

- 84) Acetylene tanks should always be stored and transported: 84) _____
 A) In such a manner as to safely store or transport the greatest number of cylinders possible.
 B) Upright and safely secured in a vertical position.
 C) Upright, but at an angle of no more than 45 degrees and safely secured.
 D) In a safely secured horizontal position.
- 85) Acetylene should never be used: 85) _____
 A) Below 15 psi. B) Above 20 psi. C) Above 15 psi. D) Below 20 psi.
- 86) Before loading a torch set onto the back of your service truck, you should: 86) _____
 A) Make sure to properly adjust the regulators.
 B) Close the cylinder valves and remove the regulators.
 C) Vent all the gas from the cylinders.
 D) Prepare a clutter free area to lay the torch set down for safety.
- 87) When the safety cap is removed from acetylene cylinders that hold 55 ft³ or more: 87) _____
 A) The cylinder must be in a vertical position.
 B) The cylinder must be laying in a horizontal position.
 C) The cylinder must be chained to a cart or structure.
 D) The cylinder must have a regulator installed on it.

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

- 88) Match the level of current passing through the body in the second column with the physiological effect in the first column. (Answers can be used more than once.) 88) _____
- A. You can start to feel the current
 B. Pain
 C. Severe pain and muscle contractions
 D. Probable death
1. 1 - 30 milliamps
 2. 30 milliamps and up
 3. 50 milliamps and above
 4. 100 milliamps and above

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

- 89) Which agency requires ground fault interrupters be used when operating power tools outside? 89) _____
 A) ANSI B) EPA C) UL D) OSHA
- 90) How often should live circuits be worked on? 90) _____
 A) When somewhat necessary B) Whenever deemed necessary
 C) When the power goes out D) Only when absolutely necessary
- 91) A simple tool that technicians can use to check for energized circuits is: 91) _____
 A) A screwdriver with a good insulated handle.
 B) A wattmeter.
 C) The digital storage oscilloscope.
 D) The non-contact voltage detector.

- 92) Federal law mandates that: 92) _____
A) All used refrigerants must be sold to an ESCO certified reclamation site.
B) All used refrigerants must be sold to a UL or ANSI certified reclamation site.
C) All used refrigerants must be sold to an OSHA certified reclamation site.
D) All used refrigerants must be sold to an EPA certified reclamation site.
- 93) When refrigerants are exposed to glowing metal surfaces or flames: 93) _____
A) A respirator capable of filtering fine dust must be worn.
B) Lethal phosgene gas is produced.
C) Carbon monoxide is produced and should be vented.
D) Best practices require the use of proper eye protection.
- 94) Why are used refrigerant oils not disposed of at an automotive oil recycler? 94) _____
A) Used refrigerant oil and used automotive oils are compatible.
B) Used refrigerant oil and used automotive oils are not compatible.
C) Used refrigerant oil and used automotive oils can be mixed during disposal.
D) Used refrigerant oil and used automotive oils are interchangeable.
- 95) How can a non-toxic, non-flammable refrigerant still be dangerous when released in a confined space? 95) _____
A) The refrigerant can replace the air, causing suffocation.
B) A chemical reaction with the air can create a toxic gas.
C) The space temperature can quickly drop below freezing.
D) A chemical reaction with the air can create a flammable byproduct.
- 96) Safe methods of heating a refrigerant cylinder during charging include (you may select more than one): 96) _____
A) An air acetylene torch adjusted to a low flame
B) An electric cylinder heater
C) Warm condenser discharge air
D) Boiling water
E) Warm water
F) An oxy-acetylene torch with a rosebud tip
- 97) The date of inspection for refrigerant containers that require inspection: 97) _____
A) Should be painted by the number of the refrigerant type on the side of the container.
B) Must be stamped on the top of the container.
C) Must be painted the same color as the refrigerant container.
D) Is always stamped on the bottom of the container.
- 98) A refrigerant container should never be heated or stored in temperatures above: 98) _____
A) 115°F. B) 125°F. C) 95°F. D) 100°F.
- 99) How would one know if a refillable refrigerant cylinder is safe to use? 99) _____
A) It will have an inspection date stamped at the bottom.
B) It will have an inspection date stamped at the side.
C) It will have an inspection date stamped at the middle.
D) It will have an inspection date stamped at the top.

- 100) Refrigerant recovery cylinders should not be filled above: 100) _____
A) 80% of their volume with liquid. B) 100% of their volume with liquid.
C) 70% of their volume with liquid. D) 90% of their volume with liquid.
- 101) How should a refrigerant cylinder be warmed up during service? 101) _____
A) With warm water not over 125°F.
B) With live steam if available.
C) Place the cylinder in a 350°F oven.
D) Use an open flame in an area that is vented outdoors.
- 102) Why should fluorocarbon refrigerant systems not be serviced around an open flame? 102) _____
A) The refrigerant is flammable.
B) The refrigerant might put out the flame.
C) Even small quantities of fluorinated refrigerant are explosive.
D) Poisonous gas can be created.
- 103) The maximum fill level for a refillable refrigerant cylinder is: 103) _____
A) 70% of its volume.
B) 100% of its volume if the cylinder is rated for that particular refrigerant.
C) 80% of its volume.
D) Refillable cylinders should not be refilled with refrigerant.
- 104) Select the gasses that are safe to use for refrigeration system pressure testing. 104) _____
A) Nitrogen B) Carbon dioxide C) Acetylene D) Oxygen
- 105) Pressure vessels can be hazardous because: 105) _____
A) They can rupture violently like a bomb.
B) They are large and technicians might trip over them.
C) They can cause electrical shock if the internal motor shorts out.
D) They emit harmful UV light at higher working pressures.
- 106) Pressure vessels such as boilers should have a placard on or near the vessel that displays: 106) _____
A) The parts per million casting impurities and the alloy shear strength.
B) The manufacturing date and type of material the vessel is made of.
C) The material the vessel is made of and the name of the inspector.
D) When it was inspected and when the next inspection should be.
- 107) Types of pressure vessels commonly used in HVACR include (you may select more than one): 107) _____
A) Refrigerant cylinder B) Oil storage tank C) Accumulator
D) Gasoline storage tank E) Boiler F) Receiver
- 108) Why might a bad driving record make it difficult to get a job at a service company? 108) _____
A) The company may be required to post a "Dangerous Driver" sign on their service vehicle.
B) Your driving record is only important if you will be driving a bus.
C) Service trucks with breathalyzer interlock cost more money.
D) Your driving record affects the cost of insurance to the company.

- 109) Why is safe driving a big part of HVACR job safety? 109) _____
A) Employers assume that safe drivers are smarter.
B) There are not many other aspects of HVACR safety.
C) Many HVACR jobs involve driving to get to the job.
D) You have to drive to get to work.
- 110) In case of an accident, the first step is: 110) _____
A) File an insurance report. B) Administer first aid.
C) Report the accident to the office. D) Call 911.
- 111) Which types of accidents should be reported? 111) _____
A) Only accidents where the injured worker is obviously hurt
B) All accidents
C) Only accidents involving loss of blood
D) Mainly electrical or refrigeration accidents
- 112) What is a service valve wrench? 112) _____
A) A tool used to change the core in Schrader valve
B) A pair of pliers that is used to turn a manual service valve stem
C) A wrench used to install service valves on a hermetic system
D) A ratchet wrench with square openings that fit service valve stems
- 113) What are the most common sizes of standard sockets? 113) _____
A) From 1/4 in. up to 1 in. by 1/16 in. increments
B) From 1/3 in. to 1 in. in 1/6 in. increments
C) From 0.1 in. up to 1 in. in 0.1 in. increments
D) Sockets do not come in different sizes.
- 114) What are the most common sizes for the shank on a socket handle? 114) _____
A) 1/4 in., 3/8 in., and 1/2 in. B) 1/8 in., 1/4 in., and 3/4 in.
C) 1/2 in., 3/4 in., and 1 in. D) 3/8 in., 3/4 in., and 1 in.
- 115) What is the difference between a flare-nut wrench and a standard box wrench? 115) _____
A) A flare wrench is just a renamed box wrench.
B) Box wrenches have only 4 sides and points, flare wrenches have 6.
C) The flare wrench heads are slotted to slip over the tubing.
D) Flare wrenches ratchet and box wrenches do not.
- 116) De-burring tools are used for: 116) _____
A) Removing rough edges from electrical wiring.
B) Preparing a compressor head before applying a head gasket.
C) Removing the small burr left by pipe cutters.
D) Removing splinters from wood frame members.
- 117) What type of tool is used to loosen the set screws on fan blade hubs? 117) _____
A) A large flat bladed screwdriver B) Locking pliers
C) Hacksaw D) Allen wrench

- 118) What tool is used to remove the hex head machine screws in equipment panels? 118) _____
A) Locking pliers B) The nut driver
C) Adjustable wrench D) Phillips head screwdriver
- 119) Electrical pliers can be used for cutting what types of material? 119) _____
A) Nails B) Steel cable C) Copper wire D) Bolts
- 120) Why is it important that the same force be used when tightening nuts and bolts on compressors? 120) _____
A) It is easier to tighten evenly all the way around.
B) You may not always have permagasket to help.
C) Most compressor heads have only 2 bolts.
D) Gaskets can seat unevenly and leak.
- 121) When using a torque wrench to tighten a circular compressor head: 121) _____
A) Tighten the bolts in a clockwise pattern working your way around the circle.
B) Set the wrench to 120% of the specification to allow for loosening.
C) Tighten all the bolts to a lower torque, repeat with a slightly higher torque, finally tighten all the bolts to the specified torque.
D) Apply a bead of silicone sealant to the gasket before starting
- 122) Two standards for flare fittings are: 122) _____
A) Tight and loose.
B) Aluminum and magnesium.
C) Imperial standard and metric.
D) The National Pipe and the Society of Automotive Engineers.
- 123) One advantage of bending tubing rather than using a brazed elbow is: 123) _____
A) Bending does not create oxides inside the pipe like brazing does.
B) Most tubing can be bent in short radii by hand.
C) One adjustable tubing bender can be used for all tubing sizes.
D) Brazed joints are more likely to kink at the ell than bends.
- 124) What are right handed aviation snips used for? 124) _____
A) Making cuts in sheet metal that curve to the left
B) Making cuts in sheet metal that curve to the right
C) Making cuts in sheet metal in any direction
D) Making long, straight cuts in sheet metal
- 125) What is the purpose of a duct stretcher? 125) _____
A) To increase the length of a sheet metal duct when it is within a 1/4 in.
B) To pull rectangular duct together when using drive cleats
C) To pull flexible duct straight
D) There is no such thing as a duct stretcher
- 126) Hacksaws cut: 126) _____
A) On both forward and back strokes.
B) in helical oscillation created by vibrating the handle.
C) On the forward stroke.
D) On the back stroke.

- 127) What is the best way to increase the turning force on a hard to turn bolt? 127) _____
A) Use a shorter length socket handle to get a better grip.
B) Strike the socket handle with a hammer.
C) Slip a length of pipe over the socket handle to increase the leverage.
D) Use a breaker bar.
- 128) Why are mushroomed chisel heads dangerous? 128) _____
A) The head becomes extremely bouncy.
B) The mushrooms on the head make it slippery.
C) Chips may break off.
D) The chisel is soft and rotten.
- 129) What PPE should be worn when handling sheet metal? 129) _____
A) Self-contained breathing apparatus
B) A respirator
C) Gloves
D) No PPE is necessary to handle sheet metal.
- 130) What should be done with damaged tools? 130) _____
A) Convert them to use for something else. B) Donate them to the Goodwill.
C) Use them more carefully. D) Throw them away.
- 131) Why should pliers not be used to tighten bolts and nuts? 131) _____
A) They will round off the corners.
B) They will strip the threads of the bolt.
C) It is too difficult to get the pliers to fit the nut.
D) They will overtighten the nut.
- 132) To keep rust from forming on hand tools, technicians can: 132) _____
A) Apply a light coat of oil to the metal parts.
B) Sand the outside of the tool periodically.
C) Keep each tool inside a plastic bag.
D) Paint all your handtools with a rust inhibiting paint.
- 133) What type of threads does a 2" x 3/8" NF-24 bolt have? 133) _____
A) National fine, 24 footpounds of torque
B) Normal capacity, 24 foot pounds of torque
C) National coarse, 24 threads per inch
D) National fine, 24 threads per inch
- 134) What type of head do most sheet metal screw have? 134) _____
A) Hex head B) Pan head
C) Round head D) Counter-sunk head
- 135) What type of head is used for screws on electrical terminals? 135) _____
A) Pan head B) Hex head
C) Round head D) Counter-sunk head

- 136) Which type of head works well for driving with a power drill? 136) _____
A) Round head with straight slot B) Pan head with phillips slot
C) Counter-sunk head with straight slot D) Hex head
- 137) A 5/16 in bolt with national course threads will have: 137) _____
A) 24 threads per inch. B) 18 threads per inch.
C) 20 threads per inch. D) 16 threads per inch.
- 138) A 5/16 in bolt with national fine threads will have: 138) _____
A) 20 threads per inch. B) 18 threads per inch.
C) 24 threads per inch. D) 16 threads per inch.
- 139) Which type of thread standard uses more threads per inch? 139) _____
A) National course NC B) National fine NF
C) AHRI standard threads D) Pipe threads
- 140) How do you prevent the rivet from spinning when you are drilling? 140) _____
A) By angling the drill bit completely to one side
B) By keeping the drill bit straight up
C) By angling the drill bit slightly to one side
D) By keeping the drill bit perpendicular to one side
- 141) How is the length of a pop rivet determined? 141) _____
A) By the radius of the tip of the pop rivet
B) By the width of the tip of the pop rivet
C) By the circumference of the head of the pop rivet
D) By the distance from the tip to the head of the pop rivet
- 142) The best way to remove a pop rivet is: 142) _____
A) A cutting torch. B) Unscrewing it.
C) A hammer and chisel. D) Drilling it out.
- 143) Enlarging of the end of a rivet is called: 143) _____
A) Upsetting the rivet. B) Flanging the rivet.
C) Terminating the rivet. D) Forging the rivet.
- 144) The best way to remove a pop rivet is: 144) _____
A) Unscrewing it. B) Drilling it out.
C) A hammer and chisel. D) A cutting torch.
- 145) How are staples used for fastening duct insulation different from normal staples? 145) _____
A) The tips of the staple are bent outward as the staple goes through the fabric.
B) They are corrugated.
C) They are stronger to pierce the sheet metal ductwork.
D) They bend inward to help secure the insulation to the duct.
- 146) For which of the following measurements is area used? 146) _____
A) Depth B) Lines C) Volume D) Surfaces

- 147) The space in a room is measured by: 147) _____
A) Square feet. B) Cubic feet. C) Feet. D) Inches.
- 148) Cubic yards are typically used to measure: 148) _____
A) Small containers of oil. B) Floor space in a home.
C) Large volumes of dirt. D) Amounts of refrigerant.
- 149) What physical properties are most often measured? 149) _____
A) Temperature, polarization, weight, distance
B) Hardness, reflectivity, volume, temperature
C) Distance, area, volume, and weight
D) Physical attributes cannot be measured
- 150) Units that cannot be measured in base units and require more than one measurement are called: 150) _____
A) BTUs. B) Customary units.
C) Volume. D) Derived units.
- 151) How many grains are in a pound? 151) _____
A) 16 B) 12 C) 7000 D) 144
- 152) Refrigerant quantities in air conditioning systems are often expressed in: 152) _____
A) Ounces, decimal pounds, or pounds and ounces.
B) psig equivalency.
C) Fahrenheit degrees equivalency.
D) Grains, grams, or poundals.
- 153) Units in the SI measurement system are subdivided into: 153) _____
A) Units of 10. B) Units divisible by 2.
C) Common fractional quantities. D) Units divisible by 3.
- 154) The SI unit for weight used today is: 154) _____
A) Meter. B) Pound. C) Kilogram. D) Ounce.
- 155) The SI unit for length is: 155) _____
A) Kilogram. B) Meter. C) Foot. D) Yard.
- 156) The SI unit used to indicate pressure in HVACR systems is: 156) _____
A) Meter. B) Psi. C) Kilogram. D) Kilopascal.
- 157) In order to determine heat flow, one must know the amount of time and: 157) _____
A) Air flow. B) British thermal units.
C) Substance weight. D) Atmospheric pressure.
- 158) What is the difference between a volume measurement and a rate measurement? 158) _____
A) Rate measurements are more flexible. B) Rate measurements include time.
C) Rate measurements are more accurate. D) Volume measurements include time.
- 159) What type of measurement is stated in square feet? 159) _____
A) Volume B) Area C) Angularity D) Length

- 160) Area measurements are used to measure: 160) _____
 A) The space in a room. B) The distance between cities.
 C) Location within a city. D) The size of a floor.
- 161) The area of a 20 inch by 24 inch filter is: 161) _____
 A) $20 + 24 = 44$ square inches. B) $20 \times 24 = 480$ square inches.
 C) $24 - 20 = 4$ square inches. D) 20 square inches with a remainder of 4.
- 162) To find the volume of a cylinder, it is necessary to: 162) _____
 A) Find the volume of the circle forming base.
 B) Multiply the diameter by the height.
 C) Calculate the area of the circle forming the base.
 D) Measure the circumference.
- 163) What units are used to measure volume? 163) _____
 A) Feet of volume B) Voluability C) Cubic feet D) Square feet
- 164) In the United States, liquid volume is measured in: 164) _____
 A) Ounces, cups, pints, quarts, gallons. B) Ounces, pounds, gross, kilo.
 C) Square inches and square feet. D) Milliliters and liters.
- 165) Which of the following is used to estimate the size of a room? 165) _____
 A) Window frames B) Room trim
 C) Bricks D) Drop ceilings
- 166) What is the estimated length of a wall that is covered by 12 pieces of sheathing hung vertically? 166) _____
 A) 24 feet B) 72 feet C) 48 feet D) 98 feet
- 167) What are the estimated dimensions of a room with a 2 foot $\times$ 2 foot drop ceiling that is 10 tiles wide and 15 tiles long? 167) _____
 A) 20 feet by 30 feet B) 20 feet by 60 feet
 C) 40 feet by 30 feet D) 10 feet by 15 feet
- 168) What is the estimated length of a building that has 35 roof rafters 24 inches on center? 168) _____
 A) 68 feet B) 66 feet C) 72 feet D) 70 feet
- 169) What is the estimated length of a wall that has 31 studs 16 inches on center? 169) _____
 A) 30 feet 4 inches B) 41 feet 4 inches C) 30 feet D) 40 feet

Answer Key

Testname: UNTITLED1

- 1) B
- 2) A
- 3) B
- 4) B
- 5) A
- 6) C
- 7) B
- 8) A
- 9) C
- 10) D
- 11) A
- 12) C
- 13) D
- 14) B
- 15) A
- 16) C
- 17) D
- 18) B
- 19) A
- 20) A
- 21) B
- 22) A
- 23) C
- 24) D
- 25) A, 3; B, 1; C, 2; D, 4
- 26) A
- 27) B
- 28) D
- 29) C
- 30) D
- 31) B
- 32) C
- 33) A
- 34) D
- 35) D
- 36) C
- 37) D
- 38) B
- 39) C
- 40) C
- 41) D
- 42) B, D, F, G
- 43) A
- 44) C
- 45) D
- 46) A
- 47) D
- 48) B
- 49) A
- 50) B

Answer Key

Testname: UNTITLED1

- 51) C
- 52) C
- 53) D
- 54) C
- 55) D
- 56) C
- 57) D
- 58) D
- 59) B
- 60) A
- 61) A
- 62) D
- 63) D
- 64) C
- 65) D
- 66) A, B, C, D, F
- 67) A
- 68) A
- 69) B
- 70) C
- 71) A, D, F
- 72) C
- 73) D
- 74) A
- 75) C
- 76) A, B, E
- 77) A, 4; B, 2; C, 1; D, 3
- 78) A
- 79) C
- 80) C
- 81) B
- 82) A, C, D, E
- 83) C
- 84) B
- 85) C
- 86) B
- 87) C
- 88) A, 1; B, 1; C, 2; D, 2; E, 3; F, 3; G, 4; H, 4
- 89) D
- 90) D
- 91) D
- 92) D
- 93) B
- 94) B
- 95) A
- 96) B, C, E
- 97) B
- 98) B
- 99) D
- 100) A

Answer Key

Testname: UNTITLED1

- 101) A
- 102) D
- 103) C
- 104) A, B
- 105) A
- 106) D
- 107) C, E, F
- 108) D
- 109) C
- 110) D
- 111) B
- 112) D
- 113) A
- 114) A
- 115) C
- 116) C
- 117) D
- 118) B
- 119) C
- 120) D
- 121) C
- 122) D
- 123) A
- 124) A
- 125) B
- 126) C
- 127) D
- 128) C
- 129) C
- 130) D
- 131) A
- 132) A
- 133) D
- 134) A
- 135) A
- 136) D
- 137) B
- 138) C
- 139) B
- 140) C
- 141) D
- 142) D
- 143) A
- 144) B
- 145) A
- 146) D
- 147) B
- 148) C
- 149) C
- 150) D

Answer Key

Testname: UNTITLED1

- 151) C
- 152) A
- 153) A
- 154) C
- 155) B
- 156) D
- 157) B
- 158) B
- 159) B
- 160) D
- 161) B
- 162) C
- 163) C
- 164) A
- 165) D
- 166) C
- 167) A
- 168) A
- 169) D