

C-20 HVAC Contractor

Practice test

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Time limit: 210 minutes

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Answer key for this session (PDF):

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1. An air conditioner has 2,400 watts of electrical input and 24,000 BTU/h of cooling. What is the EER of this system?
 - A. 2.4
 - B. 10.0
 - C. 9.0
 - D. 12.0
2. Hydrofluoric acid can be formed when HFC refrigerants are exposed to:
 - A. Water or humidity
 - B. Contact with copper tubing
 - C. Open flames or very high temperatures
 - D. Ultraviolet light
3. Which factor most significantly increases the cooling load in a building with large south-facing windows?
 - A. North-facing roof color
 - B. Internal heat from occupants
 - C. Solar heat gain through south-facing windows
 - D. Duct leakage from the supply system
4. When installing a gas furnace, the flue vent pipe must slope toward the furnace at a minimum grade of:
 - A. 1/4 inch per foot sloping upward toward the chimney
 - B. 2 inches per foot upward
 - C. 1 inch per foot downward toward the furnace
 - D. Level — no slope required
5. In duct design, the "available static pressure" for the duct system is calculated as:
 - A. Fan motor horsepower divided by airflow
 - B. Total external static pressure plus component drops
 - C. Total external static pressure minus the pressure drop of all components
 - D. Supply pressure minus return pressure

6. A change order in HVAC contracting is used when:
- Document changes to the original scope, price, and schedule before work begins
 - Inform the customer of project progress
 - Record warranty information for installed equipment
 - Order additional materials from suppliers
7. A technician measures 20°F of superheat at the evaporator outlet of an R-410A system. This indicates:
- Overcharge — liquid flooding the compressor
 - Normal — evaporator is fully active and compressor is protected
 - Severe undercharge requiring refrigerant
 - TXV is stuck closed
8. What is the purpose of a heat gain calculation for an existing building?
- Determine actual cooling load to right-size replacement equipment
 - Estimate the age of the existing system
 - Document original installation records
 - Calculate the original equipment warranty period
9. A packaged water source heat pump eliminates which component compared to a split system?
- Evaporator
 - Air-cooled condenser
 - Reversing valve
 - Capacitor
10. Proper electrical safety when working on HVAC equipment requires testing for voltage with a multimeter before touching wires. This is done to:
- Verify circuits are de-energized with a multimeter — capacitors can store lethal charge
 - Assume circuits are de-energized if the disconnect is open
 - Test only after all power to the building is disconnected
 - Use rubber gloves only, no testing needed
11. Zoning systems in residential HVAC use which primary control mechanism?
- Separate gas valves for each zone
 - Motorized dampers controlled by individual zone thermostats
 - Multiple air handlers with separate refrigerant circuits
 - A central thermostat controlling all zones simultaneously
12. Refrigerant cylinders must be stored:
- In enclosed vehicles when not in use
 - Upright, secured, away from heat sources, in ventilated areas
 - On their sides in direct sunlight for accessibility
 - Near the work area for convenience
13. A condensate overflow switch (float switch) is installed to:
- Measure condensate flow rate
 - Regulate refrigerant flow
 - Filter condensate before it drains
 - Shut off the system when the condensate drain pan fills due to a clogged drain
14. Cal/OSHA requires fall protection for workers on roofs at heights of:
- 6 feet
 - 4 feet
 - 10 feet
 - 7.5 feet
15. California's Title 24 Building Energy Efficiency Standards primarily affect HVAC contractors by requiring:
- Minimum efficiency ratings, duct sealing/insulation, and commissioning documentation
 - Only choosing aesthetically pleasing equipment
 - Filing paperwork with the state after installation
 - Using only California-manufactured equipment
16. Manual S is used in HVAC system design to:
- Analyze psychrometric properties of air
 - Calculate commercial loads
 - Select equipment whose performance matches Manual J design loads
 - Design duct systems
17. Which ACCA manual is used for residential load calculations?
- Manual J
 - Manual D
 - Manual N
 - Manual S
18. The minimum slope required for a condensate drain line is:
- 1 inch per foot
 - 1/8 inch per foot toward the drain
 - 2 inches per foot
 - Level — no slope required

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19. A zoning system with multiple dampers causes excessive noise from one zone when others are closed. The most likely cause is:
- A. The return duct is oversized
 - B. All airflow forced through open zone increases velocity — bypass damper or variable-speed unit needed
 - C. The air handler is too small
 - D. The thermostat is wired incorrectly
20. What is the purpose of a condensate trap on a forced-air cooling system?
- A. Prevent negative pressure from siphoning air through the condensate drain
 - B. Filter drain water from the condensate pan
 - C. Reduce vibration in the condensate drain line
 - D. Collect refrigerant that leaks from the evaporator coil
21. The ASHRAE Handbook — Fundamentals is primarily referenced by HVAC contractors for:
- A. Refrigerant recovery procedures
 - B. California licensing requirements
 - C. Equipment installation procedures
 - D. Scientific foundation including thermodynamics, psychrometrics, and heat transfer
22. A contractor is estimating a commercial HVAC job. The equipment cost is \$42,000 and labor is estimated at \$18,000. If overhead is 15% and profit is 10% of total costs, what is the bid price?
- A. \$72,000
 - B. \$75,900
 - C. \$69,000
 - D. \$78,000
23. SMACNA standards govern the fabrication of which HVAC components?
- A. Refrigerant handling procedures
 - B. Electrical wiring of HVAC equipment
 - C. Fabrication, installation, and testing of sheet metal duct systems
 - D. Equipment efficiency testing standards
24. A heat pump in heating mode is not achieving adequate capacity. The outdoor coil is covered with a heavy layer of ice. The most likely cause is:
- A. Thermostat set too low
 - B. Low refrigerant charge
 - C. Defrost control failure
 - D. Outdoor temperature too high
25. An air conditioning system is running but not cooling. The technician measures normal suction pressure but high head pressure. The most likely cause is:
- A. Oversized evaporator coil
 - B. Low refrigerant charge
 - C. Dirty condenser coils restricting airflow
 - D. Stuck-open TXV
26. When using a brazing torch near combustible materials, which precaution is required?
- A. Turn off the gas supply to the building
 - B. Maintain a fire watch during and for 30 min after brazing with a fire extinguisher available
 - C. No special precautions needed for torch work
 - D. Only use fire watch for outdoor brazing
27. What is the correct sequence for commissioning a newly installed split system air conditioner?
- A. Verify charge and pressures, electrical amperage, airflow, temperatures, and document all readings
 - B. Turn on the system and leave if no error codes appear
 - C. Set the thermostat and leave the customer a manual
 - D. Check refrigerant charge only and sign off
28. How often should air filters in a residential HVAC system typically be replaced?
- A. Every 5 years
 - B. Once a year
 - C. Every 1–3 months depending on type and conditions
 - D. Only when the system stops working
29. California Title 24 requires new duct systems and replacement systems to pass a duct leakage test. The maximum allowable duct leakage for new systems is:
- A. 15% of system airflow
 - B. 25% of system airflow
 - C. No leakage limit for new systems
 - D. 5% of system airflow
30. When handling liquid R-410A from a cylinder, the risk of freeze burns is because:
- A. R-410A is too warm to cause burns
 - B. Liquid refrigerant only causes irritation, not burns
 - C. Liquid R-410A rapidly freezes (cryogenic burn) exposed skin at its -61°F boiling point
 - D. R-410A causes chemical burns not freeze burns

31. When working with R-410A refrigerant, which PPE must be worn?
- A. Safety glasses and insulated gloves to protect against refrigerant burns
 - B. No PPE required for small cylinders
 - C. Hearing protection only
 - D. Full face shield and fire-resistant clothing only
32. In a duct system, a plenum is:
- A. A type of outdoor condensing unit
 - B. The air distribution chamber connected to the air handler
 - C. A type of HVAC filter
 - D. A chemical used to seal duct joints
33. What is the purpose of a Manual N calculation?
- A. Commercial building load calculations
 - B. Residential duct design
 - C. Residential equipment selection
 - D. Psychrometric analysis
34. To measure the refrigerant charge using the superheat method, a technician needs:
- A. Ambient temperature and thermostat setting
 - B. Only suction line temperature
 - C. Suction line temperature and suction pressure (to find saturation temperature)
 - D. Discharge pressure and liquid line temperature
35. An HVAC technician discovers a refrigerant leak. Under EPA Section 608, what action must be taken?
- A. Repair leaks within 30 days if leak rate exceeds applicable threshold
 - B. Vent the refrigerant and recharge
 - C. No action is required for leaks under 50 lbs
 - D. Report the leak to the EPA within 24 hours only
36. Under California law, releasing refrigerant intentionally into the atmosphere is:
- A. Illegal — prohibited by EPA Section 608 and California law with fines up to \$37,500/day
 - B. Legal if the system is being decommissioned
 - C. Legal for small quantities under 5 lbs
 - D. Legal if the refrigerant is R-22 only
37. A heat pump has a COP of 3.5 in heating mode. This means:
- A. The system efficiency is 35%
 - B. The heat pump requires 3.5 tons of capacity
 - C. The heat pump uses 3.5 times more electricity than a resistance heater
 - D. The heat pump delivers 3.5 units of heat for every 1 unit of electricity consumed
38. A cooling load calculation must account for heat gain from which of the following sources?
- A. Duct leakage only
 - B. Outdoor temperature only
 - C. Refrigerant charge only
 - D. Solar gain, conduction, internal gains, and infiltration
39. A thermocouple in a gas furnace is a safety device that:
- A. Safety device that controls the thermostat
 - B. Safety device that confirms the existence of a pilot flame
 - C. Safety device for electronic ignition
 - D. Safety control for the fan
40. A gas furnace has a cracked heat exchanger. The primary safety concern is:
- A. Increased gas consumption only
 - B. Fan motor overheating
 - C. Carbon monoxide mixing with supply air — a life-threatening hazard
 - D. Minor efficiency loss only
41. A gas furnace blower runs but no heat is produced. The inducer motor is running and ignition is attempted but no flame is established. The most likely cause is:
- A. Failed inducer motor
 - B. Cracked heat exchanger
 - C. Incorrect thermostat wiring
 - D. Failed igniter, no gas supply, or gas valve not opening
42. What is the design heating load used for in HVAC system sizing?
- A. Determine the annual fuel usage of the system
 - B. Calculate the duct airflow requirements
 - C. Size the gas supply line to the furnace
 - D. Determine the minimum heating capacity to maintain comfort during coldest conditions

43. The Global Warming Potential (GWP) of a refrigerant is a concern for California contractors because:
- High GWP refrigerants are incentivized by the state
 - California CARB regulations target high-GWP refrigerants requiring transition to lower-GWP alternatives
 - GWP only affects residential systems
 - Federal regulations preempt all California GWP rules
44. An evaporator coil is freezing up during normal operation. The most likely causes include:
- Dirty filter, low refrigerant charge, or low ambient temperatures
 - Oversized system running continuously
 - High outdoor temperature
 - High indoor humidity only
45. When brazing refrigerant lines, nitrogen should be flowed through the tubing to prevent:
- The refrigerant from escaping
 - Formation of copper oxide scale inside the tubing
 - The flame from extinguishing
 - Moisture from entering the system
46. When installing a split system, the lineset should be run with the suction line:
- On the bottom, insulated separately, with the liquid line on top
 - Buried underground for protection
 - Bundled together with the liquid line, no insulation needed
 - On top, with the liquid line below
47. What is "acid burnout" in a refrigerant compressor?
- Refrigerant reacting with copper tubing
 - Overheating of the compressor discharge
 - Moisture reacting with refrigerant and oil to form acids that damage compressor windings
 - Excessive voltage burning out motor windings
48. What does the term "sensible heat ratio" (SHR) represent in HVAC design?
- Total load ÷ equipment capacity
 - Latent load ÷ sensible load
 - Sensible load ÷ total load
 - Cooling capacity ÷ electrical input
49. During startup of a new air conditioning system, a technician measures subcooling at the condenser outlet. Proper subcooling for most systems is:
- Subcooling should be zero
 - 30–40°F
 - 0–5°F
 - 10–20°F for most systems
50. The suction line of a split air conditioning system should be sized to:
- Be as small as possible to increase velocity
 - Match the liquid line diameter exactly
 - Be sized for the total system BTU only
 - Minimize pressure drop while maintaining sufficient velocity for oil return
51. Under CSLB regulations, a C-20 contractor must not perform work that exceeds the scope of their license. Work that exceeds \$500 in combined labor and materials and is outside the HVAC scope requires:
- A general contractor to oversee the work
 - Permission from the property owner
 - A separate license classification for the out-of-scope work
 - A C-20 can perform any construction work
52. Asphyxiation is a hazard when working in confined spaces with high concentrations of refrigerant because:
- Refrigerant burns when mixed with air
 - Refrigerants are heavier than air and displace oxygen causing deficiency
 - Refrigerant reacts with oxygen to form toxic compounds
 - Refrigerant is toxic at any concentration
53. When estimating a duct system, the equivalent length method accounts for:
- Converts fittings into equivalent lengths of straight duct based on pressure drop
 - Determines duct insulation requirements
 - Measures actual duct length only
 - Calculates airflow velocity
54. When working in an attic during summer in California, heat illness prevention requires:
- Have employees drink only sports drinks
 - Work only in the early morning hours
 - No special precautions needed for short-duration attic work
 - Provide water, shade, and rest periods per Cal/OSHA regulations

55. An older R-22 system requires refrigerant but R-22 is being phased out. Per EPA regulations, a technician may:
- A. Convert the system to R-410A without any modifications
 - B. Use only reclaimed or recycled R-22 to service existing systems
 - C. Vent the remaining R-22 and use a different refrigerant
 - D. Purchase new R-22 from manufacturers
56. Manual D is the ACCA reference used for designing which component of an HVAC system?
- A. Equipment selection
 - B. Residential duct system design
 - C. Psychrometric analysis
 - D. Load calculations
57. What is the primary purpose of a psychrometric chart in HVAC system design?
- A. Calculate refrigerant charge
 - B. Determine duct sizing
 - C. Measure static pressure in duct systems
 - D. Graphically represent the properties of moist air
58. A contractor discovers that the actual job cost exceeds the original estimate by 20%. The most likely cause is:
- A. Equipment was higher quality than estimated
 - B. Inaccurate takeoffs, omissions, scope changes not covered by change orders, or unforeseen conditions
 - C. Labor was more efficient than expected
 - D. The customer added extra rooms
59. The California Mechanical Code requires that flexible duct connectors used to connect equipment to the duct system must not exceed what maximum length?
- A. 6 inches
 - B. No limit specified
 - C. 14 inches
 - D. 36 inches
60. A refrigerant recovery machine must be used before opening any refrigerant circuit. This is required by:
- A. EPA Section 608 of the Clean Air Act
 - B. Local fire department regulations
 - C. Cal/OSHA Title 8
 - D. ASHRAE Standard 15
61. When sizing a residential gas furnace, the output BTU/h capacity should be:
- A. Be selected based on the previous equipment size
 - B. Exactly match the calculated load
 - C. Not exceed 125–140% of the calculated design heating load
 - D. Be at least 200% of the calculated load for safety
62. Return air ducts in a residential HVAC system should be sized to maintain a maximum velocity of approximately:
- A. 1,500–2,000 FPM for maximum efficiency
 - B. As high as possible to move maximum air
 - C. 100–200 FPM only
 - D. 600–900 FPM to minimize noise
63. California requires all HVAC contractors to carry workers' compensation insurance when they:
- A. Workers' compensation is optional for contractors
 - B. Have 10 or more full-time employees
 - C. Have annual payroll over \$500,000
 - D. Employ one or more workers — even part-time
64. What is the purpose of a filter dryer in a refrigerant circuit?
- A. Measure system superheat
 - B. Prevent refrigerant migration during off cycles
 - C. Regulate refrigerant flow to the evaporator
 - D. Remove moisture and contaminants from the refrigerant circuit
65. An HVAC system installed in California must comply with which code for mechanical equipment?
- A. ASHRAE Standard 90.1 only
 - B. SMACNA standards only
 - C. The California Mechanical Code (Title 24, Part 4)
 - D. International Mechanical Code without amendments
66. California requires HVAC installations to be inspected and permitted. Who is responsible for obtaining the permit?
- A. The local utility company
 - B. The equipment manufacturer
 - C. The licensed contractor
 - D. The homeowner

67. California Title 24 energy standards require HVAC systems to meet minimum efficiency ratings. What does SEER2 measure?
- A. Energy factor of gas furnaces
 - B. Static pressure ratio of duct systems
 - C. Cooling efficiency of A/C and heat pumps over a typical cooling season
 - D. Heating efficiency over a season
68. The subcooling method for checking refrigerant charge is most reliable for systems with:
- A. All systems equally
 - B. Fixed orifice (piston) systems
 - C. Systems with TXVs (thermostatic expansion valves)
 - D. Systems with capillary tubes only
69. What is the most common cause of compressor failure in residential HVAC systems?
- A. Liquid refrigerant or oil entering the compressor
 - B. Dirty condenser coils
 - C. Excessive suction pressure
 - D. Failed contactor
70. Under Cal/OSHA, an employer must provide a written Injury and Illness Prevention Program (IIPP) that includes:
- A. Hazard identification and correction, employee communication, training, and recordkeeping
 - B. A form filed annually with Cal/OSHA
 - C. Equipment inspection logs only
 - D. Insurance policy requirements
71. When troubleshooting a system with a suspected refrigerant leak, an electronic leak detector should be used. The probe should be placed:
- A. In the return air stream
 - B. At the highest point in the room
 - C. At the lowest point around fittings and coils where vapors accumulate
 - D. At the suction service valve only
72. After installing a new refrigerant system, a vacuum must be pulled to remove moisture and non-condensables. The system should be evacuated to a minimum of:
- A. 5,000 microns
 - B. 1 inch of mercury vacuum
 - C. 29.9 inches Hg
 - D. 500 microns or less
73. What refrigerant is required for new residential air conditioning equipment as of January 1, 2025 per California regulations?
- A. R-407C
 - B. R-32 and R-454B (lower GWP alternatives)
 - C. R-22
 - D. R-134a
74. What is the OSHA permissible exposure limit (PEL) for carbon monoxide in the workplace?
- A. 5 ppm
 - B. 50 ppm as an 8-hour time-weighted average
 - C. 200 ppm
 - D. 500 ppm
75. Lockout/tagout (LOTO) procedures are required before:
- A. After completing all work on the system
 - B. Before any servicing where unexpected energization could cause injury
 - C. Only when working on gas appliances
 - D. Only for systems over 480V
76. What is the minimum clearance required between a condensing unit and a solid fence or wall per standard installation practice?
- A. 6 inches on all sides
 - B. 24 inches on discharge side, 12 inches on inlet sides
 - C. 48 inches on all sides
 - D. No clearance required if the unit is a mini-split
77. Under EPA Section 608, technicians who purchase refrigerants in containers larger than 2 pounds must be:
- A. Be certified by an EPA-approved organization
 - B. Complete 40 hours of safety training
 - C. Hold a contractor's license only
 - D. Anyone can purchase refrigerant in any quantity
78. A gas furnace ignites but immediately shuts off on the first call for heat. The most likely cause is:
- A. Dirty or failed flame sensor
 - B. Failed inducer motor
 - C. Incorrect thermostat setting
 - D. Cracked heat exchanger

79. An HVAC system has adequate airflow and refrigerant charge but the customer complains of high humidity in the structure. The most likely cause is:
- A. The TXV is stuck open
 - B. Oversized system short-cycles and does not run long enough to remove latent heat
 - C. The evaporator coil is undersized
 - D. The condenser coil is dirty
80. Per Cal/OSHA, a ladder must extend at least how many feet above the roofline when used for roof access?
- A. 6 feet
 - B. 3 feet
 - C. 1 foot
 - D. 5 feet
81. The California Mechanical Code requires HVAC systems to be sized based on which load calculation method?
- A. The contractor's experience and judgment
 - B. The same equipment size as the previous system
 - C. An approved heat loss/heat gain calculation per Manual J or equivalent
 - D. Rule-of-thumb sizing based on square footage
82. During preventive maintenance on a split system, which of the following tasks should always be performed?
- A. Replace the compressor annually
 - B. Clean condenser coil, check pressures and temps, inspect electrical, clean filter, check condensate drain
 - C. Only check refrigerant pressures
 - D. Only add refrigerant and replace filters
83. What reading on a combustion analyzer indicates incomplete combustion in a gas furnace?
- A. Complete and efficient combustion
 - B. Normal combustion readings within spec
 - C. Incomplete combustion — insufficient air, cracked exchanger, or improper gas pressure
 - D. The furnace is operating at peak efficiency
84. The grains of moisture per pound of dry air is a measure of:
- A. Wet-bulb temperature
 - B. Absolute moisture content (humidity ratio)
 - C. Dew point temperature
 - D. Relative humidity
85. A system has low suction pressure and low head pressure. The most likely cause is:
- A. Low refrigerant charge (undercharge)
 - B. Failed compressor valves
 - C. Dirty condenser coil
 - D. Overcharge of refrigerant
86. What is "latent heat" in the context of air conditioning?
- A. Heat energy involved in condensing moisture from air without changing temperature
 - B. Heat conducted through building walls
 - C. Heat associated with temperature change
 - D. Radiant heat gain from sunlight
87. An air handler blower motor is drawing excessive amperage. The most likely cause is:
- A. Low voltage supply to the motor
 - B. Incorrect belt tension on a belt-drive motor
 - C. Failing motor bearing, dirty blower wheel, or shorted motor winding
 - D. The motor is too small for the system
88. The refrigerant line set for a split system should be insulated to prevent:
- A. Hold the line set in place
 - B. Prevent condensation and reduce heat gain
 - C. Protect the line from physical damage
 - D. Prevent UV degradation of the copper tubing
89. A dual-run capacitor failure on an air conditioning condensing unit most commonly causes:
- A. Compressor or fan motor fails to start or draws high amperage
 - B. The TXV loses superheat control
 - C. The condenser fan blows too much air
 - D. Refrigerant migrates to the compressor
90. Electrical panels must remain accessible at all times. The minimum clearance in front of an electrical panel is:
- A. 24 inches
 - B. 12 inches
 - C. 36 inches (3 feet)
 - D. No clearance required if door can close
91. A contractor on a job site discovers that an employee has symptoms of heat stroke. The correct immediate action is:
- A. Wait to see if symptoms improve before calling for help
 - B. Have the victim walk to the emergency room
 - C. Move to cool area, apply ice packs to neck/armpits/groin, and call 911 immediately
 - D. Give the victim a cold drink and have them rest for 10 minutes

92. When installing ductwork in an unconditioned attic, California Title 24 requires duct insulation of at least:
- A. R-30
 - B. R-2
 - C. R-8
 - D. R-19
93. Which type of duct joint sealant is approved for use on HVAC duct systems per California Mechanical Code?
- A. Silicone caulk
 - B. Spray foam insulation
 - C. UL 181A or UL 181B listed mastic or foil tape
 - D. Cloth duct tape
94. CFM (cubic feet per minute) in duct design is primarily determined by:
- A. Fan motor horsepower
 - B. Duct size alone
 - C. The heating or cooling load of the room being served
 - D. The number of occupants in the room
95. A takeoff sheet in HVAC estimating is used to:
- A. List all materials and quantities required from reading the construction plans
 - B. List the HVAC equipment manufacturer warranties
 - C. Document actual installed quantities after job completion
 - D. Record customer complaints during the project
96. What is the design dry-bulb temperature used in load calculations?
- A. The temperature exceeded only 1–2.5% of the time during peak season
 - B. The average annual high temperature
 - C. The highest temperature ever recorded at the location
 - D. The minimum outdoor temperature for winter design
97. A heat pump reversing valve is energized in which mode on most residential systems?
- A. Both modes simultaneously
 - B. Neither mode — it is always de-energized
 - C. Heating mode
 - D. Cooling mode
98. A refrigerant system must be pressure tested before charging with refrigerant. What gas is used for leak testing?
- A. Carbon dioxide
 - B. Dry nitrogen
 - C. Oxygen
 - D. Compressed air
99. The electrical disconnect for an HVAC unit must be located within sight of the equipment and within how many feet?
- A. 50 feet
 - B. 10 feet
 - C. 25 feet
 - D. 100 feet
100. A split system condenser fan motor is running but the compressor is not. The technician measures voltage at the compressor contactor. What should be checked next?
- A. Replace the contactor immediately
 - B. Check the run capacitor and internal overload protector
 - C. Replace the thermostat
 - D. Add refrigerant to the system
101. What is the purpose of a TXV (thermostatic expansion valve) in a refrigeration system?
- A. Meter liquid refrigerant into the evaporator maintaining constant superheat
 - B. Remove moisture from the refrigerant circuit
 - C. Measure suction pressure at the compressor inlet
 - D. Compress refrigerant in the condenser
102. What type of respirator is required when working in spaces with oxygen-deficient atmospheres due to refrigerant accumulation?
- A. A self-contained breathing apparatus (SCBA) or supplied-air respirator
 - B. A chemical cartridge respirator
 - C. A standard N95 dust mask
 - D. No respirator needed if under 30 minutes
103. The enthalpy of air at a given condition represents:
- A. Only the temperature of the air
 - B. The static pressure of the air stream
 - C. Total heat content per pound of dry air — sensible plus latent heat combined
 - D. The humidity ratio in grains per pound
104. Refrigerant cylinders must never be heated with an open flame because:
- A. It is only prohibited for R-22 cylinders
 - B. It would cool the cylinder too quickly
 - C. It can cause the relief valve to open or cylinder to rupture catastrophically
 - D. It would contaminate the refrigerant

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- 105.** What is the function of a scroll compressor compared to a reciprocating compressor?
- A. Quieter, more efficient, and more reliable than reciprocating compressors
 - B. Used only in commercial systems
 - C. Requires higher refrigerant charge
 - D. Less efficient than reciprocating compressors
- 106.** A new split system is charged by weight. After charging, the technician verifies correct charge by:
- A. Checking system pressures only
 - B. Just by looking at the sight glass
 - C. No verification needed after charging by weight
 - D. Checking superheat and subcooling against manufacturer specifications
- 107.** What symptom indicates that a TXV is stuck closed?
- A. Normal pressures with no superheat
 - B. High suction pressure and low superheat
 - C. High suction and high head pressure
 - D. Very low suction pressure and extreme superheat
- 108.** An air conditioning system has high suction pressure and high head pressure. Both pressures are elevated. The most likely cause is:
- A. Overcharge — too much refrigerant
 - B. Low refrigerant charge
 - C. Failed condenser fan motor
 - D. Dirty evaporator coil
- 109.** Cal/OSHA requires that a safety data sheet (SDS) be available for which materials?
- A. Only for materials used outdoors
 - B. Only for flammable materials
 - C. Only for refrigerants above 50 lb cylinders
 - D. All hazardous chemicals including refrigerants, solvents, fluxes, and cleaning chemicals
- 110.** Before entering a confined space such as a mechanical room or crawl space, a technician must:
- A. Test for oxygen level, flammable gases, and toxic contaminants before entry
 - B. Enter and ventilate the space while working
 - C. Have a coworker wait outside and enter immediately
 - D. No special procedures required for crawl spaces
- 111.** A furnace heat exchanger must be inspected before startup to check for:
- A. Increased gas consumption only
 - B. Reduced heating capacity only
 - C. Furnace short-cycling
 - D. Carbon monoxide mixing with supply air — a life-safety hazard
- 112.** When installing a gas furnace, the supply air temperature rise must be within the manufacturer's specified range. Excessive temperature rise indicates:
- A. The furnace is oversized for the space
 - B. Insufficient airflow through the heat exchanger causing overheating
 - C. The gas pressure is too low
 - D. The thermostat is set too high
- 113.** What gauge sheet metal is typically used for low-pressure residential duct systems?
- A. 30-gauge
 - B. 20-gauge
 - C. 14-gauge
 - D. 26-gauge galvanized steel
- 114.** The electrical supply for a 240V split system air conditioner must be a dedicated circuit. The wire size is determined by:
- A. 125% of the equipment's rated load current (MCA on nameplate)
 - B. The longest possible wire run
 - C. The circuit breaker size only
 - D. The contractor's preference
- 115.** According to Cal/OSHA, roof work requires fall protection when working at heights of:
- A. 10 feet
 - B. 4 feet
 - C. 7.5 feet
 - D. 6 feet