Another wonderful contribution to all of us from Norm Christopherson

Quote:

This is a set of NATE like questions to give folks an idea of what the test is like. None of the questions came directly from the exams. Some of the questions I gleaned from others and some I made up myself. I just took three of the exams and then wrote a few questions that were like some of those on the exams I took. The real NATE exams consist of 50 core questions and then 100 questions on each of the other exams. They have exams on gas heat, heat pumps, air conditioning, air distribution and oil heat.

**NATE Example Questions**

None of these questions are directly from the exam. They are sample questions much like those that may appear on the actual exam to give you an idea of what the test is like.

1. A condensing unit should be mounted on a slab that is level to:

   a. Allow any accumulated water to evenly run out of the cabinet
   b. Increase airflow through the fin area
   c. Prevent the unit from tipping over
   d. Make certain any top discharge air blows straight up

2. A simple time activated switch is an example of a control that does not use:

   a. Feedback
   b. Electronics
   c. Calibration
   d. Manual adjustment
3. Which of the following systems would typically require a blower with a 2000 cfm output?

   a. 2-ton ac system  
   b. 3-ton ac system  
   c. 5-ton ac system  
   d. 7.5-ton ac system

4. A typical induced draft furnace uses a blower-off delay in the cooling mode to:

   a. Increase the efficiency of the system  
   b. Air wash the coil on shutdown  
   c. Minimize dehumidification at the coil  
   d. Prevent blowing moisture off the coil on shut off

5. 3,412 BTU

   a. 1 watt  
   b. 3.4 watts  
   c. 1 kilowatt  
   d. 3.4 kilowatts

6. Which of the following would a technician use to check the operating sequence of an air conditioning system?

   a. Schematic  
   b. Pictorial diagram  
   c. Illustration  
   d. Isometric drawing
7. Gas heating systems on roofs or other elevated locations shall be accessible by way of the building if the building is taller than;

   a. 10 feet
   b. 15 feet
   c. 20 feet
   d. 25 feet

8. Rafters in typical residential construction are how far apart?

   a. 12 inches
   b. 14 inches
   c. 16 inches
   d. 18 inches

9. Which of the following components is energized first after an intermittent ignition gas furnace calls for heat?

   a. Induced draft motor
   b. Pilot valve
   c. Blower motor
   d. Gas valve

10. To have a system automatically switch to heating or cooling as the load changes, the thermostat:

    a. System switch should be in auto
    b. System switch should be in off
    c. System switch should be on
    d. Fan switch should be in auto
11. A typical heat pump uses a high-pressure control to shut off the compressor if the condensing pressure becomes excessive. The control uses a switch that makes the compressor contact on a pressure

a. Rise at the compressor discharge  
b. Fall at the compressor discharge  
c. Difference between the high and low side  
d. Combination of the high and low side

12. Which of the following is typically covered by local codes?

a. Minimum cfm per outlet  
b. Maximum length of a trunk  
c. Termination of condensate line  
d. Refrigerant charge

13. What is the difference between the wiring of an electromechanical thermostat and an electronic thermostat?

a. Both the hot leg and the common of a 120-volt supply must be run to the electronic thermostat.  
b. Typically there is no difference, they are designed to be interchangeable  
c. Wire size used on the electronic thermostat must be larger  
d. Both the low voltage hot and common must be run to the electronic thermostat.

14. A secondary drain pan is used when an air conditioning system is located:

a. Above a ceiling  
b. In a closet  
c. Below grade  
d. More than 30 feet from a useable drain
15. A person is sitting near a cold window on a winter day. They are losing heat to the cold window by:

a. Conduction  
b. Convection  
c. Radiation  
d. Evaporation

16. In electrical wiring, the black conductor usually indicates;

a. The hot conductor  
b. The neutral conductor  
c. The ground wire  
d. The safety wire

17. Which of the following is the correct equation for determining wattage in an electrical circuit?

a. \[ W = E \times I \]  
b. \[ W = \frac{E}{I} \]  
c. \[ W = \frac{I}{R} \]  
d. \[ W = E \times R \]

18. The rpm of a motor is determined by:

a. The motor’s voltage  
b. The motor’s amperage  
c. The number of poles  
d. The size of the motor windings
19. An ohmmeter reading of infinity across a switch means;

a. The switch is open  
b. The switch is closed  
c. The switch is good  
d. The switch is bad

20. The synchronous speed of a four pole 60 Hz single phase motor is:

a. 3600 rpm  
b. 1500 rpm  
c. 3450 rpm  
d. 1800 rpm

21. Contactors are rated according to the maximum amperage through the:

a. Coil  
b. Contacts  
c. Thermostat  
d. Fuse

22. Lowering the airflow over an evaporator will:

a. Increase the temperature drop of the air and increase the amount of moisture removed from the air.  
b. Decrease the temperature drop of the air and increase the amount of moisture removed from the air.  
c. Increase the temperature drop of the air and decrease the amount of moisture removed from the air.  
d. Decrease the temperature drop of the air and decrease the amount of moisture removed from the air.
23. What is the temperature rise of 250 cfm of air if an electric heater adds 8,500 btuh to the air?

   a. 18 degrees F  
   b. 27 degrees F  
   c. 31.5 degrees F  
   d. 40 degrees F

24. When a compressor service valve is located on the compressor discharge and is back-seated;

   a. The compressor is connected to the discharge piping.  
   b. The back-seat port is closed to the compressor.  
   c. The front-seat port is open to the compressor.  
   d. All of the above are true.

25. The maximum secondary amperage of a 40VA, 240 by 24 volt control transformer would be;

   a. 1.6 amps  
   b. 6 amps  
   c. 10.5 amps  
   d. .16 amps

26. A combination electrode/nozzle gauge can be used to perform which of the following tasks?

   a. Remove the spark electrode  
   b. Remove the burner nozzle head  
   c. Measure the nozzle pressure  
   d. Position the nozzle to the burner head
27. A single trunk duct system that extends in one or two directions from the unit and has multiple branches is a (an)

   a. Perimeter duct system
   b. Extended plenum duct system
   c. Radial duct system
   d. Reducing trunk system

28. After cutting copper tubing, the tube edge should be cleaned with a:

   a. Wire brush
   b. Hacksaw blade
   c. Round file
   d. Reamer

29. Which of the following is covered by the National Fire Protection Code?

   a. Wire sizing
   b. Use of return air sensors
   c. Locations of service platforms
   d. Clearances around condensing units.

30. Maintaining manufacturer specified clearances on all sides of a condensing unit is:

   a. Necessary in residential applications only
   b. Necessary in commercial applications only
   c. Only necessary if required by local codes
   d. Necessary whenever locating the equipment
31. Of the following, which is most likely powered by a supply voltage of 240V single phase?

   a. Natural gas furnace  
   b. Residential condensing unit  
   c. Commercial packaged unit  
   d. Residential humidifier

32. Which of the following would be considered a good location to mount a wall thermostat?

   a. In a kitchen  
   b. In a bathroom  
   c. On an exterior wall  
   d. Near a return grille

33. To have a system automatically switch to heating or cooling as the load changes, the thermostat must have:

   a. System switch set in the cooling position  
   b. System switch set in the heating position  
   c. Fan switch set in the auto position  
   d. System switch set in the auto position

34. A heat pump operating in the heating mode with inadequate airflow across the indoor coil will typically have which of the following symptoms?

   a. A higher than normal temperature rise across the outdoor coil  
   b. A low than normal temperature rise across the outdoor coil  
   c. A higher than normal temperature rise across the indoor coil  
   d. A lower than normal temperature rise across the indoor coil
35. Condensate piping must be properly trapped to prevent:
   a. Ice formation in colder temperatures
   b. Condensate running off the evaporator coil
   c. Condensate overflowing the drain pan
   d. Excessive air noise in the piping

36. A BTU is defined as the amount of heat that must be added to one ________ of water to raise its temperature one degree Fahrenheit.
   a. Pound
   b. Ounce
   c. Quart
   d. Gallon

37. In a simple resistive circuit, the voltage is 24 volts and the current is 8 amps. According to Ohm’s law the resistance is:
   a. 16 ohms
   b. 3 ohms
   c. 192 ohms
   d. .5 ohms

38. A traverse joint is used to connect:
   a. Electrical wiring
   b. Ductwork
   c. Refrigerant piping
   d. Condensate pipe
39. To determine the amount of sensible heat added to the refrigerant above the saturation point in an evaporator the installer would:

   a. Perform a subcooling check on the liquid line
   b. Perform a superheat check on the evaporator line
   c. Perform a cfm check across the evaporator coil
   d. Perform a delta T check across the evaporator coil

40. To check a de-energized, normally open relay for fused contacts, a VOM would be set to check:

   a. Amps
   b. Voltage
   c. Current
   d. Ohms

41. Which of the following oil furnace components should be replaced annually?

   a. Burner head
   b. Fuel filter
   c. Flame prover
   d. Combustion chamber

42. Pigtail 120 volt wires should be connected to the supply wiring by twisting the appropriate wires together insulating and securing each connection with:

   a. Duct tape
   b. Plastic tape
   c. Wire nuts
   d. Rubber electrical tape
43. Which of the following components is typically used only on induced draft condensing gas furnaces?

a. Electronic fan control  
b. Hot surface ignition  
c. Induced draft blower motor  
d. Secondary heat exchanger

44. Proper control of temperature, humidity, air movement, air cleanliness and fresh air ventilation is:

a. To achieve a total comfort level in residential HVAC applications only.  
b. To achieve a total comfort level in commercial HVAC applications only.  
c. To achieve a total comfort level in any structure.  
d. To achieve a total comfort level in Southern states only.

45. 7,000 BTU is approximately equal to _______ KW.

a. One  
b. Two  
c. Three  
d. Four

46. Which precaution should an installer perform to keep copper from oxidizing internally while brazing a connector to the tube?

a. Hold the torch flame centered over the connector  
b. Purge the tube with an inert gas such as nitrogen  
c. Increase torch flame to its maximum setting  
d. Hold the torch flame on the tubing only
47. After connecting two sections of metal ductwork using drive cleats, you should:

a. Bend the ends of the drives over the duct  
b. Bend the ends of the drives away from the duct  
c. Cut the ends of the drives off  
d. Crimp the ends of the drives and cut off

48. The term "sheathing" in the building trade refers to:

a. Lumber used between roof beams or rafters as a base for roofing material  
b. Lumber used to brace interior and exterior walls  
c. Interior sheet rock  
d. Plywood decking in an attic

49. Which of the following areas of metal air duct design is often governed by municipal codes?

a. The size of air ducts  
b. The number of duct fittings  
c. Thickness of duct insulation  
d. Type of connections made at duct joints

50. A customer needs the outdoor condensing unit replaced. Which of the following should the size of the outdoor unit be based upon?

a. The cooling load of the space  
b. The capacity of the evaporator  
c. The size of the slab  
d. The available clearances around the unit
51. Customer complaints of "cold air blowing" from the registers of a properly charged heat pump system may be rectified by:

a. All supply registers are slightly undersized to increase air velocity
b. Any sidewall mounted supply registers are slightly oversized to increase air velocity
c. Only ceiling supply registers are slightly undersized to increase air velocity
d. All supply registers are sized correctly for both throw and velocity

52. Fresh air intake ducts, used to route outdoor air to interior spaces, connect to the:

a. Vent piping
b. Combustion air duct
c. Supply side of the duct system
d. Return side of the duct system

53. According to the Uniform Mechanical Code, an attic-mounted furnace must have a permanently mounted light fixture. Where must the switch which controls this light be located?

a. At the main circuit panel
b. Within reach of the furnace
c. Within sight of the furnace
d. At the required passageway opening
54. In the following sentence, which of the choices below would best simplify and still express the nearest meaning of the statement? "In my opinion, the new thermostat design is a change for the better".

a. An improvement  
b. A step in the right direction  
c. A help  
d. A badly needed modification  

55. Metal duct that has hung for several years must be checked for sags and misalignments because:

a. They can place excessive stress on joints and seals  
b. They increase static pressure in the duct  
c. They decrease static pressure in the duct  
d. They increase CFM at the diffusers  

56. The typical procedure for repairing a small tear in the outer foil covering of a ductboard plenum is to:

a. Cover the tear with a vapor barrier such as a piece of plastic  
b. Cover the tear with an approved foil tape  
c. Wrap the section of ductboard with insulation  
d. Cut out an area 2 inches larger than the cut and insert a replacement plug  

57. A thermistor is a component used in an electronic wall thermostat to measure:

a. Temperature  
b. Humidity  
c. Atmospheric pressure  
d. Barometric pressure
58. Two-stage heat, single-stage cool thermostats are typically used on dual fuel heat pump systems that use oil heat for second stage heating. How would the heat pump operate if the second stage of the thermostat had an open circuit on an extremely cold day? Assume the emergency heat switch is not turned on.

a. The heat pump will operate on calls for heat without energizing the oil furnace.
b. The oil furnace will operate on calls for heat without energizing the heat pump.
c. Neither the heat pump nor the oil furnace will operate in heating modes.
d. The oil furnace will operate in emergency heat mode only.

59. The slope of the condensate lines in an attic are often set by:

a. Uniform Mechanical Code
b. Underwriter
c. AGA
d. ARI

60. Which of the following joints, when properly done, will best join a copper tube to a copper fitting?

a. Compression
b. Flare
c. Sweat
d. Interference
61. Suction line refrigerant pressure and temperature are measurements needed to determine the:

a. Air temperatures entering and leaving the evaporator coil.
b. Amount of refrigerant in a system.
c. Subcooling of refrigerant leaving a condensing coil.
d. Superheat in the refrigerant leaving an evaporator.

62. On startup, a natural gas heating system has "cold air" blowing from the registers. What could be the problem?

a. Burner manifold pressure is too high.
b. Supply duct runs are too short.
c. Blower "ON" delay is set too short.
d. Blower "ON" delay is set too long.

63. A PSC condenser fan motor is not operating but the compressor runs. A voltage check of the condenser fan motor shows no voltage at the motor. Which of the following may be the cause?

a. Open run capacitor
b. Shorted run capacitor
c. Open motor windings
d. Poor or open wiring connection

64. Which of the following statements is true concerning state and local codes and regulations?

a. Local codes never override state codes.
b. Local codes always override state codes.
c. State codes always contain regulations that are more strict than local codes.
d. Local codes must be followed if they are more strict than state codes.
65. Which of the following instruments would typically be used to measure static and total pressure in a duct system?

a. Psychrometer
b. Diaphragm type differential pressure gauge
c. Portable air hood
d. Anemometer

66. Which of the following instruments must be used with the power de-energized?

a. Voltmeter
b. Ohmmeter
c. Ammeter
d. Wattmeter

67. A customer asks that you do something that your company rules specifically prohibit. When responding to their request you should:

a. Tell the customer you cannot comply with their request and leave it at that.
b. Explore with the customer the circumstances under which you might do it.
c. Tell the customer you cannot comply with their request and offer a brief explanation why you can’t.
d. Whenever possible prevent a conflict and go ahead and do it.
68. Blower belt noise is caused by which of the following?

a. Over voltage to the motor.
b. Worn pulley
c. Under voltage to the motor.
d. Wrong blower wheel

69. While checking the installation of attic mounted flexible duct, you find 7 to 9 foot spacing between duct supports. What steps if any, should be taken?

a. No steps are necessary unless the spacing is greater than 10 feet.
b. No steps are necessary since the spacings are greater than 5 feet.
c. All supports must be relocated to maintain a maximum spacing of 5 feet.
d. All supports must be relocated to maintain a minimum spacing of 7 feet.

70. A vapor charged temperature control uses what in its power element?

a. Oil
b. Water
c. Antifreeze
d. Refrigerant

71. Isolation collars are typically added to ductwork to:

a. Reduce vibration noise
b. Reduce static pressure
c. Reduce heat gain
d. Increase air velocity
72. On a typical 120 volt three prong electrical receptacle, the hot wire should be:

a. The narrow slot  
b. The wide slot  
c. Both the narrow and wide slots  
d. The round slot

73. Each phase of three-phase power is ______ degrees out of phase from each other.

a. 60 degrees  
b. 45 degrees  
c. 90 degrees  
d. 120 degrees

74. Two 5mfd capacitors are in series with one another. The total capacitance of the two is:

a. 2.5mfd  
b. 5mfd  
c. 10mfd  
d. None of these.

75. Three 10mfd capacitors are connected in parallel with each other. The total capacitance of the three is:

a. 10mfd  
b. 20mfd  
c. 30mfd  
d. None of these
76. The air temperature drop across an evaporator is measured and determined to be 30 degrees Fahrenheit. Which of the following is most likely true?

a. There is too much evaporator airflow.
b. There is too little evaporator airflow.
c. The system is overcharged.
d. The system is undercharged.

77. The square root of the number 9 is:

a. 1.5
b. 2
c. 3
d. 6

78. Air flows from an 8-inch duct where the duct is reduced to 6 inches. Which of the following is true?

a. The air velocity increases
b. The air velocity decreases
c. The CFM increases
d. The CFM decreases

79. Which of the following is true about compression ratio:

a. It is the absolute high side pressure divided into the absolute suction pressure.
b. It is the absolute suction pressure divided into the absolute high side pressure.
c. It is the high side pressure in psig divided into the suction pressure in psig.
d. It is the suction pressure in psig divided into the high side pressure in psig.
80. The speed of a three-phase motor is determined by:

   a. The voltage to the motor
   b. The current draw of the motor.
   c. The frequency of the power supplied to the motor.
   d. The number of poles in the motor.

81. Which one of the following fuse types should be used to protect the condensing unit on a residential split system air conditioning system.

   a. Time-delay
   b. Instant blow
   c. Fast reacting
   d. Series rated ground-fault

82. Which of the following organizations rates electrical components and equipment for electrical safety?

   a. ARI
   b. UL
   c. RSES
   d. ASHRAE
83. On a heat pump the "balance point" is:

a. The point at which the heat loss of a structure matches the heat pump capacity.
b. The point at which the heating load calculation matches the cooling load calculation.
c. The lowest effective outside temperature at which the heat pump can operate.
d. The most effective temperature where the heat pump’s electric auxiliary heat should be energized.

84. On a system using a reciprocating compressor, raising the evaporator pressure and/or lowering the condensing pressure will:

a. Decrease the compressor’s volumetric efficiency.
b. Increase the compressor’s volumetric efficiency.
c. Have no effect of volumetric efficiency.
d. Increase the compressor’s power consumption.

85. A heat anticipator in a typical thermostat is wired:

a. In series with the "R" terminal
b. In parallel with the "R" terminal
c. In series with the "W" terminal
d. In parallel with the "W" terminal

86. To test a capacitor with an ohmmeter, the ohmmeter should be set at:

a. The R times 1 scale
b. The R times 10 scale
c. The R times 100 scale
d. The highest ohms scale available
87. Which of the following is considered a good evacuation?

a. 2000 microns  
b. 1500 microns  
c. 1000 microns  
d. 500 microns or less.

88. A filter-drier has a temperature drop across it. Which of the following is true about the filter-drier?

a. It is partially plugged  
b. It is totally plugged  
c. A temperature drop across it is normal  
d. The filter-drier has not yet broken in

89. An FRN-R fuse is:

a. A time delay fuse  
b. An instant blow fuse  
c. Neither A nor B is true  
d. Only used on non-inductive circuits

90. A fuse must be selected according to:

a. Type, amperage and voltage  
b. Type and amperage  
c. Type and voltage  
d. Type, amperage, voltage and wattage
91. On a typical three terminal single-phase fully hermetic compressor, between which two terminals is the start winding located?

a. The two with the highest resistance
b. The two with the least resistance
c. The two with the middle resistance
d. The two with continuity to ground

92. A Ground Fault Circuit Interrupter monitors:

a. The current between the hot wire and ground
b. The current between the hot wire and the neutral wire
c. The current between the neutral wire and ground
d. The voltage across the line

93. Typical bypass humidifiers are connected:

a. Between the supply and the return ducts.
b. Between the supply and outside air intake
c. Between the outside air intake and return air duct
d. Between the exhaust air and return air ducts.

94. The typical bypass humidifier does not work well with which of the following heating system types?

a. Natural gas
b. Propane gas
c. Heat pumps & electric heat
d. Oil fired furnaces
95. During the heating season a damper located in the bypass duct of a bypass humidifier must be:

a. Closed
b. Open
c. Adjusted according to the temperature rise of the furnace
d. Adjusted according to the total cfm of the duct system.

96. As air is heated its relative humidity:

a. Increases
b. Decreases
c. Remains the same
d. None of these is correct

97. A sling Psychrometer measures:

a. Dew point temperature
b. Specific humidity
c. Relative humidity
d. Dry & wet bulb temperatures

98. A protractor is best used to:

a. Measure distance
b. Layout angles
c. Determine air velocity
d. Select a contractor
99. Which of the following is the most accurate method of balancing a duct system?

a. Proportional balancing  
b. Sequential balancing  
c. Temperature balancing  
d. Total pressure balancing

100. Which of the following statements most correctly defines the difference between "accuracy" and "precision" in instruments?

a. There is no difference between the two terms.  
b. "Accuracy" refers to how close the measurement is to the actual value being measured while "precision" refers to how small a value can be measured.  
c. "Accuracy" refers to how small a value can be measured while "precision" refers to how close the reading is to the actual value.  
d. "Accuracy" refers to the repeatability of the measurement while "precision" refers to the percentage of error in the reading.

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