

## How to take this course.

1. Download and print the test questions.
2. Log in to your account with your ID and password.
3. Viewing your status page, scroll down and click on "[Click here to start this course.](#)"
4. Begin viewing the web pages. Refer to your printed test to find the correct answers. The questions track the web pages.
5. As you find the answers, circle them on your printed copy.
6. At the end of each section, you'll enter the quiz which is the same as your printed test. Refer to your circled answers when actually answering the quiz on the web.
7. Upon passing, you will proceed to the next section. If you failed to pass, you will be moved back to the beginning of that section for more review.



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### Quiz 1

1. An atom's nucleus, or center, is made up of \_\_\_\_\_.
  - neutrons and protons
  - neutrons and electrons
  - protons and electrons
2. The \_\_\_\_\_ orbit around the nucleus.
  - protons
  - neutrons
  - electrons
3. A proton is \_\_\_\_\_.
  - a positively charged particle
  - a negatively charged particle
  - neither positively or negatively charged
4. A neutron is \_\_\_\_\_.
  - a positively charged particle
  - a negatively charged particle
  - neither positively or negatively charged
5. An electron is \_\_\_\_\_.
  - a positively charged particle
  - a negatively charged particle
  - neither positively or negatively charged
6. A molecule of water has how many atoms of hydrogen and oxygen?
  - two of hydrogen and two of oxygen
  - two of hydrogen and one of oxygen
  - one of hydrogen and two of oxygen
7. In a balanced charge, \_\_\_\_\_.
  - the electrons weigh the same as the protons
  - the protons weigh the same as the neutrons
  - the protons and the neutrons weigh the same amount
8. A positive charge has \_\_\_\_\_.
  - more electrons than protons
  - more protons than neutrons
  - more protons than electrons
  - none of the answers provided
9. Conductors are used to carry electricity because they have \_\_\_\_\_.
  - loosely held electrons in the outer orbit
  - negative neutrons
  - positive protons
  - extra electrons
10. Current flow in a conductor can be accomplished using \_\_\_\_\_.
  - friction
  - chemicals
  - magnetism
  - all of the answers provided

### Quiz 2

1. In the Ohm's law equation, electromotive force – labeled "E" is also known as \_\_\_\_\_.
  - energy
  - volts
  - power
  - electricity
2. In the Ohm's law equation, intensity – labeled "I" is also known as \_\_\_\_\_.
  - intelligence
  - illumination
  - interference
  - amps

3. In the Ohm's law equation, resistance – labeled "R" is also known as \_\_\_\_\_.
  - ohms
  - reluctance
  - residual
  - reactance
4. Typical residential voltages are \_\_\_\_\_.
  - 120v
  - 208v
  - 240v
  - all of the answers provided
5. What is the equation when solving for "I" (intensity in amps)?
  - $I = E / R$
  - $I = R / E$
  - $I = E \times R$
6. What is the equation when solving for "R" (resistance in ohms)?
  - $R = E / I$
  - $R = I / E$
  - $R = I \times E$
7. What is the amperage of a circuit with 120v and a 15-ohm strip heater?
  - 8 amps
  - 12 amps
  - 15 amps
  - 18 amps
8. What is the amperage of a circuit with 240v and a 23-ohm strip heater?
  - 9.2 amps
  - 10.4 amps
  - 15 amps
  - 18.5 amps
9. What is the amperage of a circuit with 208v and a 28-ohm strip heater?
  - 7.4 amps
  - 12.2 amps
  - 15.7 amps
  - 28 amps
10. What is the wattage of a circuit with 120v and a 15-ohm strip heater? (Two steps are needed to find the answer)
  - 960 watts
  - 1200 watts
  - 1550 watts
  - 1810 watts
11. What is the wattage of a circuit with 240v and a 23-ohm strip heater? (Two steps are needed to find the answer)
  - 1920 watts
  - 2504 watts
12. What is the wattage of a circuit with 208v and a 28-ohm strip heater? (Two steps are needed to find the answer)
  - 1545 watts
  - 1220 watts
  - 1570 watts
  - 2810 watts
13. A BTU is the amount of heat given off by a \_\_\_\_\_.
  - kitchen match
  - birthday candle
  - cup of sawdust
  - gallon of gasoline
  - cord of wood
14. How many BTUs are produced from a circuit with 120v and a 15-ohm strip heater? (Three steps are needed to find the answer)
  - 3264 BTUs
  - 1200 BTUs
  - 1550 BTUs
  - 1810 BTUs
15. How many BTUs are produced from a circuit with 240v and a 23-ohm strip heater? (Three steps are needed to find the answer)
  - 1920 BTUs
  - 8514 BTUs
  - 1550 BTUs
  - 1850 BTUs
16. How many BTUs are produced from a circuit with 208v and a 28-ohm strip heater? (Three steps are needed to find the answer)
  - 5253 BTUs
  - 1220 BTUs
  - 1570 BTUs
  - 2810 BTUs
17. The higher the resistance in a circuit, the \_\_\_\_\_ its amperage draw.
  - higher
  - lower
  - neither - it stays the same

### Quiz 3

1. In a series circuit, the loads are wired one right after another.
  - True
  - False
2. In a series circuit, if one of the loads internally fails, aka "burns out," the other loads \_\_\_\_\_.
  - continue to function
  - also "burn out"
  - receive more power and run better

- no longer perform as designed since there is no continuous electrical flow through them
  - none of the answers provided
3. In a series circuit, the total resistance is the \_\_\_\_\_ of the resistances in the circuit.
- sum of all
  - average
  - highest
  - lowest
4. Which statement is true? With more loads in a series circuit, \_\_\_\_\_.

- the greater the total resistance
- the lower the total amperage
- the amperage will be the same everywhere in the circuit
- all of the answers provided

- Step 1. Determine total resistance in ohms from the following resistance formulas.  
 Step 2. Determine I (amps) = E (volts) / R (resistance in ohms)  
 Step 3. Determine power (watts) = amps x volts  
 Step 4. Determine BTUs = watts x 3.4

Formulas:

Resistance in series  $R_{total} = R_1 + R_2 + R_3 + \dots$

Resistance in Parallel  $= \frac{1}{R_t} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_4}$

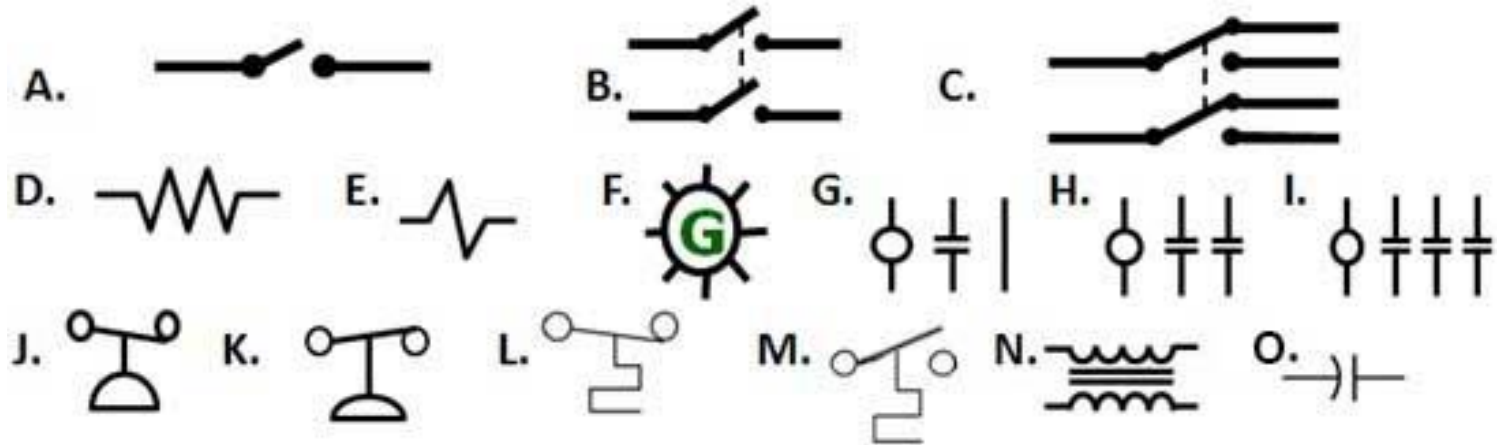
Power (watts) = I (amps) x E (volts)

Btus = watts x 3.4



5. What is the total resistance of the circuit in a series? R1 = 12 ohms, R2 = 22 ohms – 120v
- 12 ohms
  - 17 ohms
  - 22 ohms
  - 34 ohms
6. What is the amp draw of the circuit in a series? R1 = 12 ohms, R2 = 22 ohms – 120v
- 10 amps
  - 7.1 amps
  - 5.5 amps
  - 3.5 amps
7. What is the wattage of the circuit in a series? R1 = 12 ohms, R2 = 22 ohms – 120v
- 1200 watts
  - 852 watts
  - 660 watts
  - 423 watts
8. What are the BTUs produced by the circuit in a series? R1 = 12 ohms, R2 = 22 ohms – 120v (Select the closest answer.)
- 4080 BTUs
  - 2896 BTUs
  - 2244 BTUs
  - 1440 BTUs
9. What is the resulting resistance of a 25-ohm and a 15-ohm load when wired in parallel? (Select the closest answer.)
- 25 ohms
  - 15 ohms
  - 17.5 ohms
  - 40 ohms
  - 9.4 ohms
10. What is the resulting resistance of a 20-ohm and a 10-ohm load when wired in parallel with each other? (Select the closest answer.)
- 30 ohms
  - 20 ohms
  - 15 ohms
  - 10 ohms
  - 6.7 ohms
11. Given 3 resistors wired in parallel, 10 ohms, 20 ohms, and 30 ohms, determine the resulting total resistance. (Select the closest answer.)
- 60 ohms
  - 30 ohms
  - 20 ohms
  - 5.5 ohms
  - none of the answers provided
12. Given 3 resistors wired in parallel, 10 ohms, 20 ohms, and 30 ohms, determine the amps drawn in a 240v circuit. (Select the closest answer.)
- 14.5 amps
  - 24.2 amps
  - 33.6 amps
  - 43.6 amps
  - 52.1 amps
13. Given 3 resistors wired in parallel, 10 ohms, 20 ohms, and 30 ohms, determine the BTUs generated in a 240v circuit. (Select the closest answer.)
- 10,500 BTUs
  - 7500 BTUs
  - 15,000 BTUs
  - 22,500 BTUs
  - 35,600 BTUs

Quiz 4



1. Which of the above diagrams represents a DPDT switch?
  - A
  - B
  - C
  - D
  - E
2. Which of the above diagrams represents an SPST switch?
  - A
  - B
  - C
  - D
  - E
3. Which of the above diagrams represents a DPST switch?
  - A
  - B
  - C
  - D
  - E
4. Which of the above symbols represents a resistance heater?
  - D
  - E
  - F
  - N
  - M
5. Which of the above symbols represents a solenoid coil?
  - D
  - E
  - F
  - N
  - M
6. Which of the above symbols represents a signal light?
  - D
  - E
7. In the symbol shown for the signal light, the color of the light would be \_\_\_\_\_.
  - red
  - green
  - blue
  - yellow
  - orange
8. The voltage for a contactor coil could be \_\_\_\_\_.
  - 24v
  - 120v
  - 208/240v
  - all of the answers provided
9. Which of the above symbols represents a triple pole contactor?
  - A
  - B
  - G
  - H
  - I
10. Which of the above symbols represents a single pole contactor?
  - A
  - B
  - G
  - H
  - I
11. Which of the above symbols represents a double pole contactor?
  - A
  - B
  - G
  - H
  - I
12. Typically, the maximum amps on a relay contact are \_\_\_\_\_.

- 10
- 15
- 20
- 50
- 100

13. The voltage for a relay coil can be \_\_\_\_\_.

- 24v
- 120v
- 208/240v
- any of the above voltages as specified on the nameplate of the coil

14. When a relay coil is energized with the correctly rated voltage, \_\_\_\_\_.

- the "NC" contacts open and the "NO" contacts close
- the "NC" contacts open and the "NO" contacts remain open
- the "NC" contacts remain closed and the "NO" contacts close
- the "NC" contacts remain closed and the "NO" contacts remain open
- none of the answers provided

15. A typical safety device could be a \_\_\_\_\_.

- fuse
- bimetal overload
- thermal overload
- magnetic overload
- any of the answers provided

16. Which of the above symbols represents a low-pressure control?

- J
- K
- L
- M

17. Which of the above symbols represents a high-pressure control?

- J
- K
- L
- M

18. A bi-metal switch has \_\_\_\_\_ pieces of metal with different expansion rates.

- 1
- 2
- 3
- 4
- none of the answers provided

19. A cooling thermostat "close on temperature rise" is illustrated by symbol \_\_\_\_\_.

- J
- K
- L
- M

20. A heating thermostat "open on temperature rise" is illustrated by symbol \_\_\_\_\_.

- J
- K
- L
- M

### Quiz 5

1. There are several components to a complete circuit. These include \_\_\_\_\_.

- a load
- a switch
- a complete electrical path
- a power source
- all of the answers provided

2. A schematic drawing shows \_\_\_\_\_ of the components.

- photographs
- symbols
- "as built" placement
- installation requirements
- the manufacturer

3. A schematic is sometimes called a \_\_\_\_\_.

- ladder diagram
- control sequence diagram
- pictorial
- roadmap
- none of the answers provided

4. The \_\_\_\_\_ diagram is most useful when service technicians are troubleshooting.

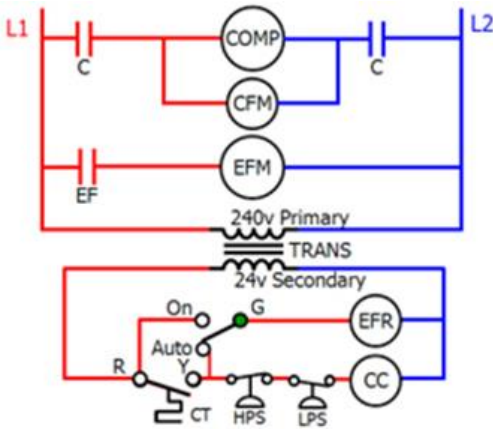
- schematic or ladder
- pictorial
- "as built"
- picture
- step stool

5. Typically, electrical systems that have more than one load have \_\_\_\_\_.

- the loads wired in series
- the loads wired in parallel
- a switch located after each load
- the sequence of operation in order of the component's appearance
- all of the answers provided

6. The typical meaning of COMP on a ladder diagram is \_\_\_\_\_.

- compensation
- component
- condenser
- compressor
- constituent



7. From the above illustration, "CC" is an abbreviation for \_\_\_\_\_.
  - compressor control
  - contactor coil
  - controlled component
  - any of the answers provided
  - none of the answers provided
8. From the above illustration, "TRANS" is an abbreviation for \_\_\_\_\_.
  - terminal switch
  - temperature switch
  - transformer
  - any of the answers provided
  - none of the answers provided
9. From the above illustration, "CFM" is an abbreviation for \_\_\_\_\_.
  - cubic feet per minute
  - condenser fan motor
  - commuted frequency motor
  - condensate flow meter
  - none of the answers provided
10. From the above illustration, "HPS" is an abbreviation for \_\_\_\_\_.
  - high pressure switch
  - hot primary surface
  - high power segment
  - heating potential surface
  - none of the answers provided
11. From the above illustration, the "HPS" is \_\_\_\_\_.
  - normally closed
  - normally open
12. From the above illustration, "LPS" is an abbreviation for \_\_\_\_\_.
  - low power system
  - lost power safety
  - last preventative safety
  - low pressure switch
  - none of the answers provided
13. From the above illustration, the "LPS" is \_\_\_\_\_.
  - normally closed

- normally open

### Quiz 6

1. A layout diagram includes \_\_\_\_\_.
    - a schematic diagram
    - a pictorial diagram
    - a component legend
    - wire color codes
    - all of the answers provided
  2. Many schematic diagrams have a marking of "T1." This means \_\_\_\_\_.
    - test 1
    - terminal 1
    - temperature 1
    - template 1
    - none of the answers provided
- A.

B.

C.
- D.

E.

F.

G.

H.

I.
- J.

K.

L.

M.

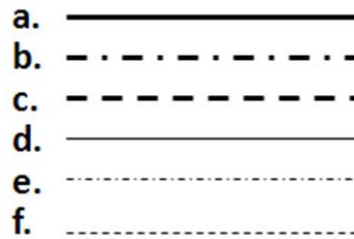
N.

O.
3. Which of the above symbols represents a run capacitor?
    - A
    - D
    - G
    - J
    - O
  4. A run capacitor is made up of thin sheets of aluminum separated by an electrolyte in a metal container.
    - True
    - False
  5. A run capacitor is located between the \_\_\_\_\_ and \_\_\_\_\_ windings.
    - run – common
    - start – common
    - start – run
    - run – continuous
    - none of the answers provided
  6. A run capacitor has a similar function as a \_\_\_\_\_.
    - fuel pump
    - side view mirror
    - carburetor
    - spark plug
    - shock absorber
  7. The "HERM" marking on a dual run capacitor means \_\_\_\_\_.
    - common
    - fan
    - Herman
    - hermetically sealed compressor

- none of the answers provided
8. The primary function of a crankcase heater is to keep the \_\_\_\_\_.
- refrigerant warm so that it can readily travel in the system
  - copper tubing warm to prevent "case hardening"
  - electrical components warm to prevent condensation from occurring
  - compressor 's oil warm to prevent the absorption of refrigerant
  - all of the answers provided
9. A crankcase heater control (CHC) \_\_\_\_\_.
- modulates the crankcase
  - controls the refrigerant temperature
  - turns off the electric heater when the proper temperature is achieved
  - none of the answers provided
10. The crankcase heater is connected to \_\_\_\_\_ voltage.
- line
  - control
  - 12 DC
  - 480 AC
  - none of the answers provided
11. The "LPC" \_\_\_\_\_.
- is a safety device
  - opens on low pressure
  - means low pressure control
  - is wired in series before the compressor's contactor coil
  - all of the answers provided
12. Low pressure in an AC system may result from \_\_\_\_\_.
- low refrigerant charge
  - a leak in the tubing
  - a dirty air filter
  - a malfunctioning blower motor
  - all of the answers provided
13. A pictorial diagram shows \_\_\_\_\_.
- field wiring required by the installer
  - factory wiring
  - the placement of components
  - the wiring between components
  - all of the answers provided
14. To determine the name of the abbreviation used, such as "CC" = compressor contactor, one would look at the \_\_\_\_\_ section of the layout diagram.
- high voltage schematic
  - low voltage schematic
  - pictorial diagram
  - component codes
  - none of the answers provided

15. Notes on the layout diagram would include electrical installation instructions.

- True
- False



16. Which wiring symbol above indicates a low voltage – factory standard wiring?

- A
- B
- C
- D
- E

17. Which wiring symbol above indicates a line voltage – factory standard wiring?

- A
- B
- C
- D
- E

18. Which wiring symbol above indicates a line voltage – field installed wiring?

- A
- B
- C
- D
- E

19. Which wiring symbol above indicates a low voltage – field installed wiring?

- B
- C
- D
- E
- F

20. Which wiring symbol above indicates a line voltage – factory option wiring?

- A
- B
- C
- D
- E

21. Which wiring symbol above indicates a low voltage – factory option wiring?

- B
- C

- D
- E
- F

22. On the layout diagram, "BR" indicates a \_\_\_\_\_ colored wire.

- black
- brown
- orange
- purple

23. On the layout diagram, "O" indicates a \_\_\_\_\_ colored wire.

- black
- brown
- orange
- purple

24. On the layout diagram, "BK" indicates a \_\_\_\_\_ colored wire.

- black
- brown
- orange
- purple

25. Schematics may have a series of numbers on the left side of the diagram which identifies the \_\_\_\_\_.

- line or circuit
- sequence of operation
- wire size
- wire type
- none of the answers provided

26. Positions of the contacts are shown \_\_\_\_\_.

- neutral
- energized
- de-energized
- powered up
- with 24 volts

27. Numbers on the upper right side of the control device coil show the line where the contacts are located.

- True
- False

28. Near the control coil symbols, the underlined numbers indicate which contacts are \_\_\_\_\_.

- NO
- NC
- energized
- de-energized
- none of the answers provided

29. Labeling of the components \_\_\_\_\_.

- is mandatory
- is not required
- may or may not be shown

- none of the answers provided

### Quiz 7

1. "Sequence of operation" typically means \_\_\_\_\_.

- one thing after another
- the order in which activities or processes proceed
- that one action precedes the following action
- all of the answers provided
- none of the answers provided

2. Sequence of operation is most easily understood with a layout diagram when using the \_\_\_\_\_.

- pictorial diagram
- schematic or ladder diagram
- equipment description
- wire codes
- wiring information

3. The transformer on a schematic diagram \_\_\_\_\_.

- divides the line voltage and low voltage portions of the illustration
- has the line voltage portion at the top of the diagram
- has the control voltage portion at the bottom of the diagram
- indicates the primary and secondary sides of the system
- all of the answers provided

4. On a fan call, \_\_\_\_\_ in the thermostat.

- R makes to C
- R makes to G
- R makes to Y
- R makes to O
- R makes to W

5. On a cooling call, \_\_\_\_\_ in the thermostat.

- R makes to C & G
- R makes to G & W
- R makes to Y & G
- R makes to O & Y
- R makes to W & G

6. The cooling thermostat closes on \_\_\_\_\_.

- temperature rise
- temperature fall
- humidity rise
- humidity fall
- none of the answers provided

7. The "EFM" is energized on a cooling call which moves air across the evaporator coil \_\_\_\_\_.

- to prevent coil icing
- to boil the refrigerant in the indoor coil
- to prevent low pressure from occurring
- all of the answers provided
- none of the answers provided