

Electrical Review

RV3.27.2020

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How to take this course.

1. Download and Print the test questions.
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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 failed to pass, you will be moved to the beginning of that section for more review.

- **Mobile users** – Many current mobile devices are compatible with AnytimeCE and will probably work. If not, use a desktop or laptop computer to complete your course.
- **WA. Electricians** – WA L&I require all online test questions and answers to be randomized. Be sure to answer all of the test questions on your printed copy.

Quiz 1: WA Electricians: Answer all questions - 50% of the following will appear in random order with random answers -as required by WA LNI

1. An electron has a _____ charge.
 - positive
 - negative
 - neutral
2. In a stable atom, the number of positively charged particles is _____ the number of negative charged particles.
 - equal to
 - greater than
 - less than
3. The positively charge particle of an element is a/n _____.
 - atom
 - electron
 - proton
 - neutron
 - none of the answers provided
4. The center of the atom, the nucleus, is made up of the following:
 - A. electrons
 - B. protons
 - C. neutrons
 - D. all of the answers provided
 - E. only B and C

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5. The electrons in the outer shell are known as _____.
 - valance electrons
 - outer orbit electrons
 - M3 level electrons
 - none of the answers provided
6. Materials that easily move electrons are _____.
 - atoms
 - conductors
 - insulators
 - resistors
 - all of the answers provided
7. Atoms that have received an extra electron are known as _____.
 - depleted atoms
 - charged atoms
 - overcharged atoms
 - full atoms
8. If positive and negative bodies are joined together by a copper wire, which of the following would happen?
 - An atomic explosion.
 - Nothing.
 - Electrons would move in the wire from the negative charged body to the positive charged body.
 - Electrons would move in the wire from the positive charged body to the negative charged body.
9. As the number of electrons in the outer orbit increases, the atoms change in behavior from a/n _____ to a/n _____.
 - conductor – insulator
 - insulator – conductor
 - no change in either
10. Which of the following is NOT an insulator?
 - electrical tape
 - copper wire
 - plastic
 - dry wood
 - dry leather
11. Corrosion on a terminal is not desired because it _____.
 - acts as an insulator and creates heat at the terminal
 - discolors the wire's insulation
 - makes a system look old
 - allows too much electricity to flow
12. Like charges _____.
 - repel
 - attract
 - have no effect on each other
 - none of the answers provided
13. In which of the following ways can electricity be produced?
 - chemical (batteries)
 - thermal
 - photo-electrical
 - magnetically (generated)
 - all of the answers provided
14. A dry cell has the following part(s):
 - one single metal
 - two metals
 - two metals and a paste
 - none of the answers provided
15. The ANODE in a battery is _____.
 - positively charged
 - negatively charged
 - neutrally charged
16. The CATHODE in a battery is _____.
 - positively charged
 - negatively charged
 - neutrally charged
17. A typical material used in a cathode is _____.
 - carbon black and manganese dioxide
 - charcoal and dioxin paste
 - rubber and silicon paste
18. An alkaline battery would use _____ as a base.
 - alklinous
 - sulfuric acid
 - formic acid
 - potassium hydroxide
19. The metal _____ is normally used for an anode.
 - iron
 - steel
 - silver
 - zinc
20. Dry cells can be recharged.

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- True
- False

21. A wet cell uses _____ instead of a paste between the 2 plates.

- solid
- liquid
- gas

- electromagnetic sponge material

22. The electrolyte in a wet cell is typically _____.

- water
- formic acid
- sulfuric acid
- potassium hydroxide



23. Which of the above symbols represents a negative electron, or cathode?

- 1
- 2
- 3
- 4
- 5

24. Which of the above symbols represents a positive proton, or anode?

- 1
- 2
- 3
- 4
- 5

25. Which of the above symbols represents a battery, or direct current?

- 1
- 2
- 3
- 4
- 5

26. Magnets are surrounded with lines of force that are called flux.

- True
- False

27. Two positive magnetic poles attract each other.

- True
- False

28. The right-hand rule for electricity states that if you put your right hand on the wire with

your thumb in the direction of flow, your fingers show the direction of the magnetic flux.

- True
- False

29. As the current increases in a wire, _____.

- the strength of the magnetic field increases
- the strength of the magnetic field decreases
- the strength of the magnetic field does not change
- the strength of the magnetic field is not influenced by current flow

30. If an iron bar is wrapped with a wire and electricity is flowing through the wire, the iron bar acts like a magnet.

- True
- False

31. Reversing the direction of electrical flow in an electromagnet DOES NOT reverse the N. S. poles of the electromagnet.

- True
- False

32. A coil of wires wrapped around a metal plunger is called a _____.

- haploid
- diploid
- semiotic
- solenoid

33. When a coil of wires wrapped around a metal plunger is energized, the coil of wires acts like a _____.

- magnet

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- resistance heater
- RF coil
- none of the answers provided

34. When a wire is moved through a magnetic field, electricity flows in the wire.

- True
- False

35. The flow of AC electricity changes direction during a cycle.

- True
- False

36. In generation electricity, an armature coil is needed. The armature coil is a _____.

- rotation loop of wire
- stationary loop of wire
- rotation magnet
- stationary magnet

37. The maximum voltage generated is found at _____ degrees in the position of the armature vs. the magnetic poles.

- zero
- 45
- 66
- 90
- 180

38. Voltage measured in a home is about 70% of the peak voltage that is generated.

- True
- False

Quiz 2 WA Electricians: Answer all questions - 50% of the following will appear in random order with random answers -as required by WA LNI

1. Which of the following is not a basic part of an electric circuit?

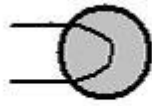
- Fuse



1



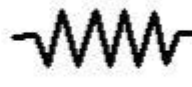
2



3



4



5



6

7. Which of these symbols represents OHMS?

- 1

- Source of power
- Load
- Switch
- Conductors

2. Electricity can be understood by comparing electricity with a hydraulic system. Amps are similar to _____.

- pressure in psig
- flow in gpm
- pressure loss
- a control valve

3. Electricity can be understood by comparing electricity with a hydraulic system. Ohms in the system are similar to _____.

- pressure in psig
- flow in gpm
- pressure loss
- a control valve

4. Electricity can be understood by comparing electricity with a hydraulic system. Power voltage is similar to _____.

- pressure in psig
- flow in gpm
- pressure loss
- a control valve

5. Electricity can be understood by comparing electricity with a hydraulic system. An electrical switch is similar to _____.

- pressure in psig
- flow in gpm
- pressure loss
- a control valve

6. The units used to measure resistance are _____.

- ohms
- volts
- amps

- 2
- 3

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- 4
 - 5
8. Which of these symbols represents a MOTOR?
- 1
 - 2
 - 3
 - 4
 - 5
9. Which of these symbols represents a RESISTANCE HEATER?
- 1
 - 2
 - 3
 - 4
 - 5
10. Which of these symbols represents a LIGHT?
- 1
 - 2
 - 3
 - 4
 - 5
11. Which of these symbols represents a SOLENOID COIL?
- 1
 - 2
 - 3
 - 4
 - 5
12. Which of these symbols represents an ELECTRICAL LINE?
- 2
 - 3
 - 4
 - 5
 - 6
13. Which wire is the largest in diameter?
- 8 gauge
 - 10 gauge
 - 12 gauge
 - 16 gauge
 - 20 gauge
14. By increasing the diameter of a wire, more electrons, increased amps, can flow without the buildup of heat.
- True
 - False
15. Which table should be used to determine the ampacities that a wire can safely carry?
- 103
 - 130
 - 210
 - 310
 - 315
16. The table mentioned in question 15 is found in which of the following texts?
- 2020 NEC
 - 2009 UPC
 - 2009 IBC
 - WAC Chapter 54
17. When selecting a wire size and finding that the amp load is between 2 sizes of wire, the electrician should always select _____.
- the smaller size since it is cheaper
 - the smaller size since it is easier to handle
 - the smaller size since it weighs less
 - the larger size, since it is required by code
18. NEC 310.15(B)(16) Electrical tables, indicate that a 12-gauge wire should be able to carry 20 amps. Field practice limits the amperage to _____ amps.
- 30
 - 25
 - 20
 - 15
19. Using the wire-sizing table shown on page 62 of the internet course, what size wire should be selected for 35 amps if no de-rating factors are applied?
- 6
 - 8
 - 10
 - 12
20. Using the wire-sizing table shown on page 62 of the internet course, what size wire should be selected for 30 amps if no de-rating factors are applied?
- 12
 - 10
 - 8
 - 6
21. Using the wire-sizing table shown on page 62 of the internet course, what size wire

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- should be selected for 50 amps if no de-rating factors are applied?
- 12
 - 10
 - 8
 - 6
22. Using the wire-sizing table shown on page 62 of the internet course, what size wire should be selected for 45 amps if no de-rating factors are applied?
- 12
 - 10
 - 8
 - 6
23. Using the wire-sizing table shown on page 62 of the internet course, what size wire should be selected for 28 amps if no de-rating factors are applied?
- 12
 - 10
 - 8
 - 6
24. As more wires are bundled together, the heat generated by the wires cannot be dissipated. Therefore, the wires can carry _____ the original design ampere load.
- more than
 - less than
 - the same as
25. Using Table 310.15(B)(16) at the end of the study guide or the table on page 76 of the course, what is the adjustment factor (_____%) for 5 current-carrying wires in a bundle?
- 100
 - 80
 - 70
 - 50
 - 40
26. Using Table 310.15(B)(16) at the end of this study guide or the table on page 76 of the course, what is the adjustment factor (_____%) for 15 current-carrying wires in a bundle?
- 100
 - 80
 - 70
 - 50
 - 40
27. Using Table 310.15(B)(16) at the end of this study guide or the table on page 76 of the course, what is the adjustment factor (_____%) for 3 current-carrying wires in a bundle?
- 100
 - 80
 - 70
 - 50
 - 40
28. By definition, a continuous load is _____ or more of continuous operation.
- 1 hour
 - 2 hours
 - 3 hours
 - 6 hours
 - 24 hours
29. In sizing conductor wires, a load must be multiplied by _____ if it is found to be a continuous load.
- 100%
 - 125%
 - 150%
 - 175%
 - 200%
30. Wire is in an ambient location of 85°F, what is the temperature adjustment factor? (See *DE-RATING for Ambient Temps found at the end of this guide – 140°F column*)
- 1.08
 - 1.00
 - 0.91
 - 0.82
 - 0.71
31. Wire is in an ambient location of 110°F, what is the temperature adjustment factor? (See *Table DE-RATING for Ambient Temps found at the end of this guide – 140°F column.*)
- 1.08
 - 1.00
 - 0.91
 - 0.82
 - 0.71
32. Wire is in an ambient location of 125°F, what is the temperature adjustment factor? (See *Table DE-RATING for Ambient Temps*)

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found at the end of this guide – 140°F column)

- 0.91
 - 0.82
 - 0.71
 - 0.58
 - 0.41
33. What is the minimum sized wire for a 20-amp load for the following conditions: continuous load, 5 wires in the bundle, 110°F? (Refer to all 3 tables at the end of the study guide)
- 6 gauge
 - 8 gauge
 - 10 gauge
 - 12 gauge
 - 14 gauge
34. What is the minimum sized wire for a 30-amp load for the following conditions: non-continuous load, 7 wires in the bundle, 120°F? (Refer to all 3 tables at the end of the study guide)
- 1/0
 - 3 gauge
 - 4 gauge
 - 6 gauge
 - 8 gauge
35. What is the minimum sized wire for a 40-amp load for the following conditions:
- continuous load, 3 wires in the bundle, 125°F? (Refer to all 3 tables at the end of the study guide)
 - 1/0
 - 3 gauge
 - 4 gauge
 - 6 gauge
 - 8 gauge
36. A standard plug fuse will fit in an S type fuse holder.
- True
 - False
37. A standard plug fuse can be reset.
- True
 - False
38. Circuit breakers are interchangeable between manufacturers.
- True
 - False
39. The common rating of a circuit breaker is in _____.
- volts
 - ohms
 - arch corona rating
 - amps
 - dielectric strength

Quiz 3 WA Electricians: Answer all questions - 50% of the following will appear in random order with random answers -as required by WA LNI

1. A series/parallel circuit is represented by illustration _____.

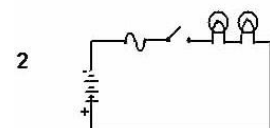
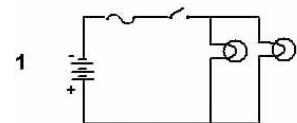
- 1
- 2
- 3

2. A parallel circuit is represented by illustration _____.

- 1
- 2
- 3

3. A series circuit is represented by illustration _____.

- 1
- 2
- 3

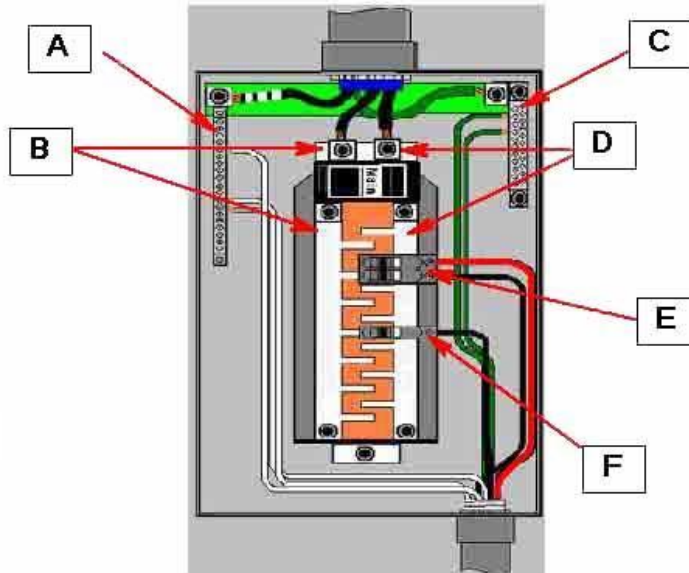


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4. A transformer can produce _____.
 - AC voltage
 - DC voltage
 - both AC and DC
5. A transformer can _____.
 - step up voltage
 - step down voltage
 - both step up and step down voltage
6. Voltage is transferred from one side of the transformer to the other side by a process called _____.
 - introduction
 - transmutation
7. The major proven problem with the transmission of voltages over long distances is _____.
 - attraction
 - theokanises
 - induction
 - transmission lines overheating
 - resistance in the wire and resulting voltage drops
 - obtaining right of way for access
 - magnetic flux lines causing cancer
 - vulnerability to terrorist attacks

Power Distribution in Residential / Commercial



8. The ground buss bar is labeled _____.
 - A
 - B
 - C
 - D
 - E
 - B
 - C
 - D
 - F
9. The L1 buss bar is labeled _____.
 - A
 - B
 - C
 - D
 - E
10. The 120v breaker is labeled _____.
 - A
11. The L2 buss bar is labeled _____.
 - A
 - B
 - C
 - D
 - E
12. The neutral buss bar is labeled _____.
 - A

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- A
 - B
 - C
 - D
 - E
13. Water heaters with a rated circuit load in excess of 3,500 watts at 208 volts must have wire no smaller than _____ AWG.
- 6
 - 8
 - 10
 - 12
 - 14
14. When testing continuity (resistance) your meter should be set to _____.
- ohms
 - volts
 - watts
 - amps
 - none of the answers provided
15. On a resistance test, when the probes of your meter are touching each other, you should read _____, and when the probes are separated by an air space, you should read _____.
- O.L. – 0 or close to it
 - 14 ohms – O.L.
 - 0 – over 250
 - 0 or close to it – O.L.
 - less than 100 – more than 1000
16. If work is required on electrical equipment that has a fused disconnect box, what is the first thing that should be done?
- Protect yourself and put the key to the lockout in your pocket.
 - Turn the disconnect connecting the arm or lever to the off position.
 - Check with a voltage pen to verify that power is off.
 - Secure power to the electrical circuit by locking out the breaker or disconnect box.
 - Remove the fuses from the disconnect box.
17. If work is required on electrical equipment that has a fused disconnect box, what is the second thing that should be done?
- Protect yourself and put the key to the lockout in your pocket.
 - Turn the disconnect connecting the arm or lever to the off position.
- Check with a voltage pen to verify that power is off.
 - Secure power to the electrical circuit by locking out the breaker or disconnect box.
 - Remove the fuses from the disconnect box.
18. If work is required on electrical equipment that has a fused disconnect box, what is the third thing that should be done?
- Protect yourself and put the key to the lockout in your pocket.
 - Turn the disconnect connecting the arm or lever to the off position.
 - Check with a voltage pen to verify that power is off.
 - Secure power to the electrical circuit by locking out the breaker or disconnect box.
 - Remove the fuses from the disconnect box.
19. If work is required on electrical equipment that has a fused disconnect box, what is the fourth thing that should be done?
- Protect yourself and put the key to the lockout in your pocket.
 - Turn the disconnect connecting the arm or lever to the off position.
 - Check with a voltage pen to verify that power is off.
 - Secure power to the electrical circuit by locking out the breaker or disconnect box.
 - Remove the fuses from the disconnect box.
20. If work is required on electrical equipment that has a fused disconnect box, what is the last thing that should be done?
- Protect yourself and put the key to the lockout in your pocket.
 - Turn the disconnect connecting the arm or lever to the off position.
 - Check with a voltage pen to verify that power is off.
 - Secure power to the electrical circuit by locking out the breaker or disconnect box.
 - Remove the fuses from the disconnect box.
21. What is the first step in rescuing a person?
- Use a non-conducting wooden broom handle to move the electrical wire from the victim.
 - Find breaker and disconnect and turn off power. If you cannot find the breaker/disconnect, proceed.
 - If victim is unconscious, apply first aid and CPR. Call 911 for medical attention.

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- Cover the victim and keep the victim warm until rescue paramedics get there.
22. What is the second step in rescuing a person?
- Use a non-conducting wooden broom handle to move the electrical wire from the victim.
 - Find breaker and disconnect and turn off power. If you cannot find the breaker/disconnect, proceed.
 - If victim is unconscious, apply first aid and CPR. Call 911 for medical attention.
 - Cover the victim and keep the victim warm until rescue paramedics get there.
23. What is the third step in rescuing a person?
- Use a non-conducting wooden broom handle to move the electrical wire from the victim.
- Find breaker and disconnect and turn off power. If you cannot find the breaker/disconnect, proceed.
 - If victim is unconscious, apply first aid and CPR. Call 911 for medical attention.
 - Cover the victim and keep the victim warm until rescue paramedics get there.
24. What is the fourth step in rescuing a person?
- Use a non-conducting wooden broom handle to move the electrical wire from the victim.
 - Find breaker and disconnect and turn off power. If you cannot find the breaker/disconnect, proceed.
 - If victim is unconscious, apply first aid and CPR. Call 911 for medical attention.
 - Cover the victim and keep the victim warm until rescue paramedics get there.

AMBIENT TEMPERATURE	DE-RATING FOR AMBIENT TEMPERATURES		
	SAMPLE TABLE		
	60° C (140° F)	75° C (167° F)	90° C (194° F)
	Types TW, UF	Types RHW, THHW, THW, THWN, XHHW, USE, ZW	Types TBS, SA, SIS, FEP, FEPB, MI, RHH, RHW-2, THHN, THHW, THW-2, THWN-2, USE-2, XHH, XHHW, XHHW-2, ZW-2
	COPPER		
70 - 77	1.08	1.05	1.04
78 - 86	1.00	1.00	1.00
87 - 95	0.91	0.94	0.96
96 -104	0.82	0.88	0.91
105 -113	0.71	0.82	0.87
114 -122	0.58	0.75	0.82
123 - 131	0.41	0.67	0.76
132 - 140	-	0.58	0.71
141 - 158	-	0.33	0.58
159 - 176	-	-	0.41

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Table 310.15 (C) (1) Adjustment Factors for More Than Three Current Carrying Conductors	
Number of Current- Carrying Conductors	Percent of Values in Tables 310.16
4-6	80
7-9	70
10-20	50
21-30	45
31-40	40
41 and above	35

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Table 310.16 Ampacities of Insulated Conductors with Not More Than Three Current-Carrying Conductors in Raceway, Cable, or Earth (Directly Buried)

Temperature Rating of Conductor (See Table 310.4(A))							
		60° C (140° F)	75° C (167° F)	90° C (194° F)	60° C (140° F)	75° C (167° F)	90° C (194° F)
		Types TW, UF	Types RHW, THHW, THW, THWN, XHHW, USE, ZW	Types TBS, SA, SIS, FEP, FEPB, MI, RHH, RHW- 2, THHN, THHW, THW-2, THWN-2, USE-2, XHH, XHHW, XHHW-2, ZW-2	Types TW, UF	Types RHW, THHW, THW, THWN, XHHW, USE	Types TBS, SA, SIS, THHN, THHW, THW- 2, THWN-2, RHH, RHW-2, USE-2, XHH, XHHW, XHHW-2, ZW-2
Size AWG or kcmil	COPPER			ALUMINUM OR COPPER-CLAD AL			Size AWG or kcmil
18			14				
16			18				
14*	20	20	25				
12*	25	25	30	20	20	25	12
10*	30	35	40	25	30	35	10
8	40	50	55	30	40	45	8
6	55	65	75	40	50	60	6
4	70	85	95	55	65	75	4
3	85	100	110	65	75	85	3
2	95	115	130	75	90	100	2
1	110	130	150	85	100	115	1
1/0	125	150	170	100	120	135	1/0
2/0	145	175	195	115	135	150	2/0
3/0	165	200	225	130	155	175	3/0
4/0	195	230	260	150	180	205	4/0