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Basic Electricity CEU Training Course $200.00
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Start and Finish Dates: ___________________________ You will have 90 days from this date in order to complete this course

List number of hours worked on assignment must match State Requirement. ________
California DPH is 5 hours and all other States is 8, 10 or 12 hours.

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Basic Electricity CEU Course Answer Key

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1. A  B  C  D  E  F
2. A  B  C  D  E  F
3. A  B  C  D  E  F
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48. A  B  C  D  E  F
49. A  B  C  D  E  F
50. A  B  C  D  E  F
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I understand that this course will cover general laws, regulations, required procedures and work rules relating to electrical principles. It should be noted, however, that the federal and state regulations are an ongoing process and subject to change over time. This course is a continuing education course for employees who are learning general electrical principles but are not allowed to work on electrical projects unless qualified or licensed. It is not designed to meet the full requirements of the Department of Labor-Occupational Safety and Health Administration (OSHA) rules and regulations. Only qualified licensed electricians should be allowed to work on any or all electrical installations or components. This course will not qualify you to work on any type of electrical system or component.

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BASIC ELECTRICITY CEU TRAINING COURSE
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Basic Electricity CEU Course Assignment

The Assignment (Exam) is also available in Word on the Internet for your Convenience, please visit www.ABCTLC.com and download the assignment and e-mail it back to TLC.

You will have 90 days from the start of this course to complete in order to receive your Professional Development Hours (PDHs) or Continuing Education Unit (CEU). A score of 70% is necessary to pass this course. We prefer if this exam is proctored. No intentional trick questions. If you should need any assistance, please email all concerns and the completed manual to info@tlch2o.com.

We would prefer that you utilize the enclosed answer sheet in the front, but if you are unable to do so, type out your own answer key. Please include your name and address on your Answer Key and make copy for yourself. You can e-mail or fax your Answer Key along with the Registration Form to TLC. (S) Means answer may be plural or singular. Multiple Choice Section, One answer per question and please use the answer key.

The Wonder of Electricity
1. Electrically charged matter is influenced by and produces electromagnetic fields.
   A. True B. False

2. Electrical charges produce _____________ which act on other charges.
   A. Electric charge D. Electromagnetic fields
   B. Electricity E. Ampere(s)
   C. Electrical current F. None of the Above

3. An electric field is an especially simple type of electromagnetic field produced by an electric charge even when it is not moving.
   A. True B. False

4. Which of the following terms produces a force on other charges in its vicinity?
   A. Electric charge D. Charge
   B. Electric field E. Ampere(s)
   C. Electrical current F. None of the Above

5. Electric potential is the capacity of an electric field to do work on an electric charge, typically measured in?
   A. Electric power D. Amps
   B. Electric charge E. Hertz
   C. Volts F. None of the Above

6. Which of the following terms is a movement or flow of electrically charged particles, typically measured in amperes?
   A. Electric charge D. Hertz
   B. Electricity E. Ampere(s)
   C. Electrical current F. None of the Above

7. Electromagnets: Moving charges produce a magnetic field.
   A. True B. False
8. Electrical currents generate magnetic fields, and changing magnetic fields generate?
A. Electric power   D. Electrical current(s)
B. Electric charge   E. Electromagnetic field(s)
C. Charged matter    F. None of the Above

How Electricity Is Generated
9. A generator is a device that converts mechanical mass into electrical energy.
A. True   B. False

10. When the electromagnetic shaft rotates, it induces a small _______ in each section of the wire coil.
A. Electric charge   D. Conduction
B. Electricity       E. Ampere(s)
C. Electrical current F. None of the Above

11. Each section of the wire becomes a small, separate electric conductor. The small currents of individual sections are added together to form one large current.
A. True   B. False

12. An electric utility power station uses either a turbine, engine, water wheel, or other similar machine to drive an electric generator — a device that converts mechanical or _______ to electricity.
A. Electric charge   D. Hertz
B. Chemical energy   E. Ampere(s)
C. Electrical current F. None of the Above

Joules
13. According to the text, a thousand joules is equal to?
A. 100 Amps          D. 100 Hertz
B. 100 horsepower     E. Kinetic energy
C. A British thermal unit F. None of the Above

14. According to the text, electrons are passed from atom to atom, creating _______ from one end to other.
A. An electrical current D. A viable source of electricity
B. Good insulators       E. A variety of heat sources
C. Energy storage        F. None of the Above

15. Which of the following terms measures how well something conducts electricity?
A. Electron(s)          D. Electrical energy
B. Conductor(s)         E. Kinetic energy
C. Its resistance       F. None of the Above

16. Rubber, plastic, cloth, glass and dry air are good insulators and have?
A. An electrical current D. Very high resistance
B. Good insulators       E. A variety of heat sources
C. Energy storage potential F. None of the Above
Electrical Generation and Transmission

17. According to the text, generation and transmission of electrical energy, is known as the Tesla effect, can lift light objects and generate sparks, but it is extremely inefficient.
A. True  B. False

18. According to the text, it was not until the invention of the voltaic pile in the eighteenth century that ____________ became available.
A. An electrical current  D. A viable source of electricity
B. Good insulators  E. A variety of heat sources
C. Energy storage  F. None of the Above

19. According to the text, for large electrical demands electrical energy must be generated and transmitted continuously over conductive transmission lines.
A. True  B. False

20. Which of the following terms store energy chemically and make it available on demand in the form of electrical energy?
A. Electron(s)  D. The stored form of electrical energy
B. Conductor(s)  E. Kinetic energy battery
C. The voltaic pile  F. None of the Above

21. The battery’s __________ is finite, and once discharged it must be disposed of or recharged.
A. An electrical current  D. A viable source of electricity
B. Power  E. A variety of heat sources
C. Energy storage  F. None of the Above

22. According to the text, the modern steam turbine invented by Sir Charles Parsons generates about 80 percent of the electric power in the world using ________________.
A. Solar  D. A viable source of electricity
B. Natural resources  E. A variety of heat sources
C. Energy  F. None of the Above

Faraday's Homopolar Disc Generator

23. Generators rely on his electromagnetic principle that a conductor linking a changing magnetic field induces a ______________ across its ends.
A. Potential difference  D. The form of electrical energy
B. Magnetic  E. Kinetic energy
C. Charge  F. None of the Above

24. The transformer meant that electrical power could be transmitted more efficiently at a higher voltage but?
A. High electrical current  D. Lower current
B. Poor insulators  E. A variety of heat sources
C. Poor energy storage  F. None of the Above
Common electrical units used in formulas and equations are:

25. Which of the following terms- unit of electrical potential or motive force - potential is required to send one ampere of current through one ohm of resistance?
   A. Volt  D. Ohm
   B. Kilovolt Ampere  E. Power Factor
   C. Watt  F. None of the Above

26. Which of the following terms is a unit of resistance?
   A. Volt  D. Ohm
   B. Ampere  E. Static electricity
   C. Watt  F. None of the Above

27. Power Factor - ratio of watts to?
   A. Volt  D. Ohm
   B. Kilovolt Ampere  E. Power Factor
   C. Volt amperes  F. None of the Above

28. Which of the following terms are units of current?
   A. Volt  D. Ohm
   B. Kilovolt Ampere  E. Ampere
   C. Watt  F. None of the Above

29. Which of the following terms is a unit of electrical energy or power?
   A. Volt  D. Ohm
   B. Ampere  E. Static electricity
   C. Watt  F. None of the Above

30. Which of the following terms is a product of volts and amperes as shown by a voltmeter and ammeter - in direct current systems the volt ampere is the same as watts or the energy?
   A. Volt  D. Volt Ampere
   B. Kilovolt Ampere  E. Power Factor
   C. Watt  F. None of the Above

31. According to the text, a Kilovolt Ampere - one kilovolt ampere is equal to?
   A. 500 Volts  D. KVA
   B. 100 Amperes  E. Kilovolt Ampere
   C. 1,000 Watt  F. None of the Above

Static and Current Electricity

32. Static electricity is an imbalance of electric charges within or on the surface of a material.
   A. True  B. False

33. Static electricity charge remains until it is able to move away by means of an electric current or?
   A. Dissipates  D. Current electricity
   B. Finds resistance  E. Electrical discharge
   C. Release  F. None of the Above
34. _______________ is named in contrast with current electricity, which flows through wires or other conductors and transmits energy.
   A. Volts     D. Current electricity
   B. Amperes   E. Static electricity
   C. Wattage   F. None of the Above

**Contact-induced Charge Separation**

35. Which of the following terms can be exchanged between materials on contact?
   A. Gravitation   D. A separation of charge
   B. Electron(s)   E. Piezoelectric charge
   C. The triboelectric effect  F. None of the Above

36. _______________ is the main cause of static electricity as observed in everyday life.
   A. Electric conflict   D. A separation of charges
   B. Tesla effect   E. Piezoelectric
   C. The triboelectric effect   F. None of the Above

37. Which of the following terms causes your hair to stand up and causes static cling?
   A. Piezoelectric effect   D. A separation of charge
   B. Electron(s)   E. Contact-induced charge separation
   C. The triboelectric effect   F. None of the Above

**Electromagnets and Electromagnetism**

**Magnetic field circles around a current**

38. Magnetic fields exist around all sides of a wire carrying an electric current and there is a direct relationship between electricity and magnetism.
   A. True   B. False

39. In Ørsted's experiments, the force on the compass needle did not direct it to or away from the current-carrying wire, but acted at right angles to it.
   A. True   B. False

40. Ørsted's slightly obscure words were that "___________ acts in a revolving manner."
   A. Electric conflict   D. The electric conflict
   B. Magnetism   E. Electrolysis
   C. A positive current   F. None of the Above

41. The force was not dependent on the direction of the current, for if the flow was reversed, then the force remained the same.
   A. True   B. False

**Electric Current**

42. The movement of electric charge is known as an electric current, the intensity of which is usually measured in amperes.
   A. True   B. False

43. Which of the following terms can consist of any moving charged particles?
   A. Current   D. Electrical conduction
   B. Speed of light   E. Electric power
   C. Electromagnetic current   F. None of the Above
44. __________________ is defined as having the same direction of flow as any positive charge it contains.
   A. Electric conflict  
   B. Magnetism  
   C. A positive current  
   D. Electrical spark(s)  
   E. Electrolysis  
   F. None of the Above

45. According to the text, the motion of negatively charged electrons around an electric circuit, one of the most familiar forms of current, is thus deemed positive in the opposite direction to that of the?
   A. Current  
   B. Electrons  
   C. Electromagnetic emissions  
   D. Electrical conduction  
   E. Electric power  
   F. None of the Above

46. __________________ can consist of a flow of charged particles in either direction, or even in both directions at once, depending on the conditions.
   A. Electric conflict  
   B. Magnetism  
   C. A positive current  
   D. Positive-to-negative convention  
   E. Electric current  
   F. None of the Above

47. Which of the following terms passes through a material is termed electrical conduction?
   A. Electric current  
   B. Speed of light  
   C. Electromagnetic current  
   D. Electrical effect  
   E. Electric power  
   F. None of the Above

48. _______________ is where electrons flow through a conductor such as metal, and electrolysis.
   A. Electric conflict  
   B. Magnetism  
   C. A positive current  
   D. Metallic conduction  
   E. Electrical conduction  
   F. None of the Above

49. While the particles themselves can move quite slowly, sometimes with an average drift velocity only fractions of a millimeter per second, the electric field that drives them itself propagates at close to the?
   A. Current  
   B. Speed of light  
   C. Electromagnetic emissions  
   D. Electrical conduction  
   E. Electric power  
   F. None of the Above

**What is Electric Power?**

50. Electric power is the rate at which electric energy is transferred by an electric circuit.
   A. True  
   B. False

51. The SI unit of power is the watt, one joule per second.
   A. True  
   B. False

**Water and Electrical Principles Are Very Similar**

52. The electronic–hydraulic analogy is the most widely used analogy for "Hydraulic fluid" in a metal conductor.
   A. True  
   B. False
53. Electricity was originally understood to be a kind of energy, and the names of certain electric quantities are derived from heating equivalents.
A. True  B. False

54. Since electric current is invisible and the processes at play in electronics are often difficult to demonstrate, the various electronic components are represented by?
A. Volts  D. Hydraulic equivalents
B. Electron fluid  E. Hydraulic ohm analogy
C. Pressure  F. None of the Above

Basic Ideas
55. Large tanks of water are held up high, or are filled to differing water levels, and the potential energy of the water head is the pressure source.
A. True  B. False

56. Flow and pressure variables can be calculated in fluid flow network with the use of the?
A. Volts  D. Hydraulic equivalents
B. Electron fluid  E. Hydraulic ohm analogy
C. Pressure  F. None of the Above

Component Equivalents
57. If water is flowing horizontally, so that the force of gravity can be ignored and then electric potential is equivalent to?
A. Nothing to the circuit  D. Pressure
B. Voltage in a capacitor  E. Section of pipe
C. Force of gravity  F. None of the Above

58. Electric potential: In general, it is equivalent to kinetic energy.
A. True  B. False

59. Connecting one end of a wire to a circuit is equivalent to forcibly un-capping one end of the pipe and attaching it to another pipe.
A. True  B. False

60. When comparing to a piece of wire, a water pipe should be thought of as having semi-permanent caps on the ends.
A. True  B. False

61. Memristor is a needle valve operated by a flow meter.
A. True  B. False

62. A capacitor cannot "filter out" constant pressure differences frequency pressure differences.
A. True  B. False

63. A wire with only one end attached to a circuit will do nothing; the pipe remains capped on the free end, and
A. Nothing to the circuit  D. A needle valve
B. Voltage in a capacitor  E. Thus adds nothing to the circuit
C. Force of gravity  F. None of the Above
64. Usually measured in amperes, current is equivalent to a______________; that is, the volumetric quantity of flowing water over time.
   A. Stretched rubber  D. Hydraulic volume flow rate
   B. Rubber diaphragm  E. Flowing water
   C. Flow meter  F. None of the Above

65. According to the text, a transistor is a valve in which a diaphragm, controlled by a low-current signal moves __________ which affects the current through another section of pipe.
   A. A plunger  D. A needle valve
   B. Voltage in a capacitor  E. Section of pipe
   C. Force of gravity  F. None of the Above

66. According to the text, an inductor is a heavy paddle wheel placed in?
   A. Valve assembly  D. A positive displacement pump
   B. Potential difference  E. The current
   C. Feedback control  F. None of the Above

67. Which of the following term does the inductor and its blades are analogous to inductance, and friction between its axle and the axle bearings corresponds to______________.
   A. Resistance to current  D. The mass and surface area of the wheel
   B. Quantity of water  E. Capacitor
   C. Water level  F. None of the Above

68. According to the text, the ideal voltage source, or ideal battery is a dynamic pump with?
   A. Valve assembly  D. A positive displacement pump
   B. Potential difference  E. Water flow
   C. Feedback control  F. None of the Above

69. Another analogy is______________, if one terminal is kept fixed at ground, sufficiently large that the drawn water does not affect the water level.
   A. Resistance to current  D. The mass and surface area of the wheel
   B. Quantity of water  E. A large body of water at a high elevation
   C. Water level  F. None of the Above

70. A resistor is considered a constriction in the bore of the pipe which requires less pressure to pass the same amount of water.
   A. True  B. False

71. All pipes have___________, just as all wires have some resistance to current.
   A. Resistance to current  D. The mass and surface area of the wheel
   B. Quantity of water  E. Some resistance to flow
   C. Water level  F. None of the Above

72. Voltage is also called voltage drop or?
   A. Valve assembly  D. A positive displacement pump
   B. Potential difference  E. Water flow
   C. Feedback control  F. None of the Above

73. Voltage is the difference in pressure between two points, usually measured in volts.
   A. True  B. False
74. According to the text, electric charge is equivalent to___________________.
A. Resistance to current   D. The mass and surface area of the wheel
B. Quantity of water       E. Capacitor
C. Water level            F. None of the Above

75. According to the text, a diode is equivalent to a two-way check valve with a tight valve seal.
A. True   B. False

76. As with a diode, a small pressure difference is needed before the valve opens, and like a diode, too much reverse bias can damage or destroy the___________________.
A. Valve assembly       D. A positive displacement pump
B. Potential difference E. Water flow
C. Feedback control     F. None of the Above

**Understanding Voltage**

77. Voltage, electrical potential difference, electric tension or electric pressure and measured in units of electric potential.
A. True   B. False

78. Volts, or joules per coulomb is the electric potential difference between two points, or the difference in electric potential energy of a unit charge transported between two points.
A. True   B. False

79. Which of the following terms is equal to the work done per unit charge against a static electric field to move the charge between two points?
A. Energy       D. Voltage
B. Pressure     E. Charge
C. Electric potential F. None of the Above

80. ________________ may represent either a source of energy or lost, used, or stored energy.
A. Electric current   D. A static (unchanging) electric field
B. Voltage           E. Electric potential difference
C. Electromotive force F. None of the Above

81. A voltmeter can be used to measure the ___________ between two points in a system?
A. Energy       D. Voltage
B. Pressure     E. Charge
C. Electric potential F. None of the Above

82. According to the text, voltage can be caused by this missing term or, by electric current through a magnetic field, by time-varying magnetic fields, or some combination of these three.
A. Electric current   D. A static (unchanging) electric field
B. Static electric fields E. Electric potential difference
C. Electromotive force F. None of the Above

83. Voltage is electric potential energy per unit charge, measured in amps per coulomb.
A. True   B. False
84. Which of the following terms must be distinguished from electric potential energy by noting that the "potential" is a "per-unit-charge" quantity?
A. Energy  D. Voltage
B. Pressure  E. Charge
C. Electric potential  F. None of the Above

85. Electric potential is mathematically expressed as the line integral of the electric field and the time rate of change of voltage.
A. True  B. False

86. __________________ along with the dynamic electromagnetic field must be included in determining the voltage between two points.
A. Electric current  D. A static (unchanging) electric field
B. Voltage  E. Electric potential difference
C. Electromotive force  F. None of the Above

87. Which of the following terms is now obsolete but tension is still used?
A. Energy  D. Voltage
B. Pressure  E. Charge
C. Electric potential  F. None of the Above

88. __________________ is defined so that negatively charged objects are pulled towards higher voltages.
A. Electric current  D. A static (unchanging) electric field
B. Voltage  E. Electric potential difference
C. Electromotive force  F. None of the Above

89. Which of the following terms can flow from lower voltage to higher voltage, but only when a source of energy is present to "push" it?
A. Energy  D. Voltage
B. Pressure  E. Charge
C. Current  F. None of the Above

90. Which of the following terms is not the only factor determining charge flow?
A. Electric field  D. Resistance
B. Voltage  E. Electric potential difference
C. Electromotive force  F. None of the Above

91. The electric potential of a material is not even a well-defined quantity, since it varies on the subatomic scale.
A. True  B. False

Faraday's Law
92. According to the text, any change in the magnetic environment of a coil of wire will cause a ____________ to be "induced" in the coil.
A. Voltage  D. Magnetic flux in the loop constant
B. Electrical energy  E. Lorentz force
C. Magnetic field strength  F. None of the Above
**Lenz’s Law**

93. When an EMF is generated by a change in magnetic flux according to Faraday’s Law, the polarity of the induced EMF is such that it produces a current whose magnetic field opposes the change which produces it.
   A. True   B. False

94. The induced magnetic field inside any loop of wire always acts to keep the induced electromotive force in the loop constant.
   A. True   B. False

**The most widespread version of Faraday’s law states:**

95. Which of the following terms in any closed circuit is equal to the negative of the time rate of change of the magnetic flux through the circuit?
   A. An electromagnet   D. The induced electromotive force
   B. An electromotive force   E. Faraday’s Law
   C. Magnetic flux   F. None of the Above

**Electrical Generator**

96. _______________ is generated by Faraday’s law of induction due to relative movement of a circuit and a magnetic field.
   A. EMF   D. Magnetic flux in the loop constant
   B. Electrical energy   E. Lorentz force
   C. Magnetic field strength   F. None of the Above

97. An electromotive force is created when a permanent magnet is moved relative to?
   A. An electromagnet   D. Other inefficiencies
   B. An electromotive force   E. A conductor
   C. Magnetic flux   F. None of the Above

98. According to the text, if a wire is connected through magnetic flux in the loop constant, current will flow, and thus electrical energy is generated, converting the mechanical energy of motion to electrical energy.
   A. True   B. False

99. With Faraday’s disc example, the disc is rotated in a uniform magnetic field perpendicular to the disc, causing a current to flow in the radial arm due to the?
   A. An electromagnet   D. Other inefficiencies
   B. An electromotive force   E. Lorentz force
   C. Magnetic flux   F. None of the Above

**Understanding Resistance**

100. According to the text, except in special superconductor materials, ______________generally do not freely flow.
   A. Electron(s)   D. Resistance
   B. Current   E. Volts
   C. Potential difference   F. None of the Above
101. No electrons move at all until the voltage or __________ is very high, typically thousands of volts.
   A. Ohms   D. Electrically conductive liquids and slurries
   B. EMF   E. Amperes
   C. Size of the charge   F. None of the Above

102. In those materials with high __________ few electrons will move.
   A. Amps   D. Resistance
   B. Current   E. Volts
   C. Potential difference   F. None of the Above

103. Resistance is measured in ____________ and is designated by the symbol Ω (omega).
   A. Ohms   D. Potential difference
   B. EMF   E. Amperes
   C. Size of the charge   F. None of the Above

Measuring Resistance
104. The symbol "V" is used to represent something called the?
   A. Electron(s)   D. Resistance
   B. Current   E. Amperes
   C. Potential difference   F. None of the Above

105. Which of the following terms is the amount of work done in moving a charge between two points, divided by the size of the charge?
   A. Ohms   D. Potential difference
   B. EMF   E. Amperes
   C. Size of the charge   F. None of the Above

106. According to the text, the potential difference is measured in volts, and potential is commonly referred to as voltage. "I" is the symbol for current and "R" is the symbol for the ___________ of the system.
   A. Electron(s)   D. Resistance
   B. Current   E. Volts
   C. Potential difference   F. None of the Above

107. Current is measured in amperes and resistance is measured in ____________ .
   A. Ohms   D. Electrically conductive liquids and slurries
   B. EMF   E. Amperes
   C. Size of the charge   F. None of the Above

Ohm's Law tells us that:
108. Which of the following terms increases, current decreases; if resistance decreases, current increases?
   A. Ohms   D. Resistance
   B. EMF   E. Amperes
   C. Size of the charge   F. None of the Above

109. Current is directly proportional to?
   A. Electron(s)   D. Voltage
   B. Current   E. Volts
   C. Potential difference   F. None of the Above
What is Electrical Resistance?

110. The electrical resistance of an electrical conductor is the opposition to the passage of an electric current through that conductor; the inverse quantity is?
A. The voltage difference  	D. Proportional to the potential difference
B. Classical mechanics  	E. Electrical conductance
C. Its resistivity  	F. None of the Above

111. Which of the following terms shares some conceptual parallels with the mechanical notion of friction?
A. Conductance  	D. Infinity
B. Electrical resistance  	E. Current
C. Electric field vector  	F. None of the Above

112. All materials show some resistance, except for superconductors, which have a?
A. The voltage difference  	D. Proportional to the potential difference
B. Resistance of zero  	E. The charge is negative
C. Its resistivity  	F. None of the Above

113. In other cases of a diode or battery, V and I are not directly proportional, or in other words the I–V curve is not a straight line through the origin, and Ohm's law does not hold, in this case, resistance and _____________ are less useful concepts, and more difficult to define.
A. Conductance  	D. Infinity
B. Electrical resistance  	E. Current
C. Electric field vector  	F. None of the Above

Kirchoff’s Contribution

114. If the charged object has a___________, the force will be in the direction of the electric field vector at that point.
A. The voltage difference  	D. Proportional to the potential difference
B. Positive charge  	E. Charge is negative
C. Its resistivity  	F. None of the Above

115. Which of the following terms is given by the quantity of the charge multiplied by the magnitude of the electric field vector?
A. Conductance  	D. The magnitude of the force
B. Electrical resistance  	E. Current
C. Electric field vector  	F. None of the Above

116. According to the text, a net force acting on an object will cause it to accelerate, as explained by __________ which explores concepts such as force, energy, potential etc.
A. The voltage difference  	D. Proportional to the potential difference
B. Classical mechanics  	E. The charge is negative
C. Its resistivity  	F. None of the Above

117. Which of the following terms at infinity is assumed to be zero?
A. Conductance  	D. The electric potential
B. Electrical resistance  	E. Current
C. Electric field vector  	F. None of the Above
Potential Difference
118. The voltage difference between any two points in a circuit is known as the Potential Difference or _____________________________.
A. The voltage difference  D. Proportional to the potential difference
B. Voltage Drop  E. The charge is negative
C. Its resistivity  F. None of the Above

119. Which of the following terms flows around a circuit in the form of electrical charge, potential difference does not move it is applied?
A. Conductance  D. Infinity
B. Electrical resistance  E. Current
C. Electric field vector  F. None of the Above

120. Ohm's Law states that for a linear circuit the current flowing through it ______ across it.
A. The voltage difference  D. Is not proportional to the potential difference
B. Electrical resistance  E. Is proportional to the potential difference
C. Its resistivity  F. None of the Above

121. ________________ is usually taken to be at zero volts (0V) and everything is referenced to that common point in a circuit.
A. Conductance  D. Ground potential
B. Electrical resistance  E. Current
C. Electric field vector  F. None of the Above

122. To complete the analysis, we work backwards to the original circuit, applying Kirchoff’s laws: Kirchoff’s Current Law: The sum of currents entering a junction must equal the sum of currents leaving that?
A. Voltage difference  D. Potential difference
B. Junction  E. The charge is negative
C. Resistivity  F. None of the Above

Direct Current (DC) or Alternating Current (AC)
123. In engineering or household applications, current is often described as being either direct current (DC) or alternating current (AC).
A. True  B. False

124. Which of the following terms as produced by example from a battery and required by most electronic devices, is a unidirectional flow from the positive part of a circuit to the negative?
A. Alternating current  D. An electric field
B. Capacitance  E. Direct current
C. Negative  F. None of the Above

125. ___________________ is any current that reverses direction repeatedly; almost always this takes the form of a sine wave?
A. Lines of force  D. Alternating current
B. Test charge  E. Energy in first one direction
C. Electric field  F. None of the Above
126. According to the text, alternating current thus pulses back and forth within __________ without the charge moving any net distance over time.
A. Alternating current  D. An electric field
B. Capacitance  E. A conductor
C. Negative  F. None of the Above

127. It delivers energy in first one direction, and then the reverse, making the time-averaged value of __________ is zero.
A. Lines of force  D. An alternating current
B. Test charge  E. Energy in first one direction
C. Electric field  F. None of the Above

128. Which of the following terms is affected by electrical properties that are not observed under steady state direct current?
A. Alternating current  D. An electric field
B. Capacitance  E. Gravity
C. Negative  F. None of the Above

129. These properties are important when circuitry is subjected to __________, such as when first energized.
A. Lines of force  D. Transients
B. Test charge  E. Energy in first one direction
C. Electric field  F. None of the Above

Electric Field
130. Which of the following terms is created by a charged body in the space that surrounds it, and results in a force exerted on any other charges placed within the field.
A. Alternating current field  D. An electric field
B. Capacitance  E. Gravity
C. Negative field  F. None of the Above

131. The electric field acts between two charges in a similar manner to the way that the __________ between two masses.
A. Lines of force  D. Gravitational field acts
B. Test charge  E. Energy in first one direction
C. Electric field  F. None of the Above

132. Which of the following terms always acts in attraction, drawing two masses together, while the electric field can result in either attraction or repulsion?
A. Alternating current  D. An electric field
B. Capacitance  E. Gravity
C. Negative  F. None of the Above

133. Which of the following terms at a distance is usually zero?
A. Lines of force  D. Transients
B. Test charge  E. Energy in first one direction
C. Electric field  F. None of the Above
134. ________________ varies in space, and its strength at any one point is defined as the force that would be felt by a stationary, negligible charge if placed at that point.
   A. Alternating current  D. An electric field
   B. Capacitance  E. Gravity
   C. Negative  F. None of the Above

135. Which of the following terms must be vanishingly small to prevent its own electric field disturbing the main field?
   A. Lines of force  D. Transients
   B. Test charge  E. Energy in first one direction
   C. Electric field  F. None of the Above

136. As the electric field is defined in terms of force, and force is a vector, so it follows that an electric field is also a vector, having both magnitude and direction, it is called?
   A. Alternating current  D. An electric field
   B. Capacitance  E. A vector field
   C. Negative  F. None of the Above

137. The study of electric fields created by stationary charges is called electrostatics. The field may be visualized by a set of imaginary lines whose direction at any point is the same as that of the field.
   A. True  B. False

138. ________________ emanating from stationary charges have several key properties: first, that they originate at positive charges and terminate at negative charges.
   A. Lines of force  D. Field lines
   B. Test charge  E. Energy in first one direction
   C. Electric field  F. None of the Above

139. A hollow conducting body carries all its charge on its outer surface. The field is therefore zero at all places inside the body.
   A. True  B. False

140. This operating principal of the Faraday cage is a conducting metal shell which isolates its interior from ________________.
   A. Outside electrical effects  D. This principle
   B. Electric field strength  E. The charge
   C. Electrical breakdown  F. None of the Above

141. Which of the following terms are important when designing items of high-voltage equipment?
   A. Outside electrical effects  D. This principle
   B. Electric field strength  E. The principles of electrostatics
   C. Electrical breakdown  F. None of the Above

142. There is a finite limit to the electric field strength that may be withstood by any medium.
   A. True  B. False
143. Air tends to arc across small gaps at __________ which exceed 30 kV per centimeter.
A. Electric field strengths  D. 10,000 volts
B. Electric strength  E. 1,000 volts
C. 100 amps  F. None of the Above

144. The voltage of a large lightning cloud may be as high as 100 MV and have discharge energies as great as 250 kWh.
A. True  B. False

145. Which of the following terms is greatly affected by nearby conducting objects, and it is particularly intense when it is forced to curve around sharply pointed objects?
A. The field strength  D. Potential of the surface
B. Electric field strength  E. Faraday cage
C. Electrical breakdown  F. None of the Above

**Electric Potential**

146. Which of the following terms is closely linked to that of the electric field?
A. Two specified points  D. Electrically uncharged—and unchargeable
B. Force  E. The concept of electric potential
C. Electric potential difference  F. None of the Above

147. A small charge placed within an electric field experiences a pressure, and to have brought that charge to that point against the pressure requires a charge.
A. True  B. False

148. According to the text, the electric potential at any point is defined as the energy required to bring a unit test charge from _______________ slowly to that point?
A. Earth itself  D. An infinite distance
B. An electric field  E. Potential of the surface
C. Potential  F. None of the Above

149. This definition of potential, while formal, has little practical application, and a more useful concept is that of electric potential difference, and is the energy required to move a unit charge between?
A. Two specified points  D. Electrically uncharged—and unchargeable
B. Force and voltage  E. Two potentials of the surface
C. Electric potential difference  F. None of the Above

150. ______________________ has the special property that it is conservative, which means that the path taken by the test charge is irrelevant.
A. Earth itself  D. Earth
B. Potential of the surface  E. An electric field
C. Potential  F. None of the Above

151. Which of the following terms is strongly identified as the unit of choice for measurement and description of electric potential difference?
A. Volt  D. Electrically charged
B. Force  E. Potential of the surface
C. Electric potential difference  F. None of the Above
152. It is useful to define a common reference point to which potentials may be expressed and compared. While this could be at infinity, a much more useful reference is the?
A. Earth itself  D. Earth ground
B. An electric field  E. Potential of the surface
C. Potential  F. None of the Above

153. Earth is therefore electrically uncharged—and unchargeable and assumed to be an infinite source of equal amounts of ________________.
A. Electrons  D. Power
B. Positive and negative charge  E. Potential
C. Electric potential difference  F. None of the Above

154. Electric potential is a scalar quantity, that is, it has only magnitude and not direction.
A. True  B. False

155. Which of the following terms was formally defined as the force exerted per unit charge?
A. EMF  D. Negative charge
B. The electric field  E. Potential of the surface
C. Potential  F. None of the Above

156. Where the equipotentials lie closest together and usually expressed in volts per meter, the __________is the line of greatest slope of potential.
A. Vector direction of the field  D. Electrically uncharged—and unchargeable
B. Force  E. Potential of the surface
C. Electric potential difference  F. None of the Above

Understanding Single-Phase Power
157. Which of the following terms refers to the distribution of alternating current electric power using a system in which all the voltages of the supply vary in unison?
A. Three-phase service  D. The waveforms of the three supply conductors
B. High power systems  E. Single-phase electric power
C. Double phase  F. None of the Above

158. Which of the following terms is used when loads are mostly lighting and heating, with few large electric motors?
A. Power frequency  D. Double-phase power distribution
B. Three phase(s)  E. Single-phase distribution
C. Poly-phase distribution  F. None of the Above

159. ________________ connected to an alternating current electric motor does not produce a revolving magnetic field.
A. Three-phase service  D. The waveforms of the three supply conductors
B. High power systems  E. Voltages of the supply vary in unison
C. A single-phase supply  F. None of the Above

160. Which of the following terms, the currents in each conductor reach their peak instantaneous values sequentially?
A. Power frequency  D. Double-phase power distribution
B. Three phase(s)  E. Single-phase distribution
C. Poly-phase distribution  F. None of the Above
161. ___________ of the three supply conductors are offset from one another in time by one-third of their period.
A. Three-phase service  D. The waveforms
B. High power systems  E. Voltages of the supply vary in unison
C. Single phase  F. None of the Above

162. Which of the following terms are connected to windings around the interior of a motor stator, they produce a revolving magnetic field; such motors are self-starting?
A. Power frequency  D. Soft start
B. Three phase(s)  E. Squirrel cage
C. Poly-phase distribution  F. None of the Above

**Standard Frequencies of Single-Phase Power**

163. Standard frequencies of single-phase power systems are either 50 or 60 Ohms.
A. True  B. False

164. The lowest supply normally available as single phase varies according to the standards of the electrical utility.
A. True  B. False

165. High power systems, say, hundreds of kVA or larger, are nearly always?
A. Three-phase  D. The waveforms of the three supply conductors
B. High power systems  E. Voltages of the supply vary in unison
C. Single phase  F. None of the Above

166. In North America, individual residences and small commercial buildings with services up to about 417 amperes at 240 volts will usually have three-wire single-phase distribution, often with only one customer per distribution transformer.
A. True  B. False

167. According to the text, in densely populated areas of cities, network power distribution is used with many customers and many supply transformers connected to provide hundreds or thousands of kVA, a load concentrated over a few hundred square meters.
A. True  B. False

**Understanding Three-Phase Power**

168. The three-phase system was introduced and patented by George Westinghouse.
A. True  B. False

169. Which of the following terms electric power is a common method of alternating-current electric power generation, transmission, and distribution?
A. Power frequency  D. Single-phase power distribution
B. Three phase(s)  E. Balanced load
C. Poly-phase distribution  F. None of the Above

170. Which of the following terms is more economical than others because it uses less conductor material to transmit electric power than equivalent single-phase or two-phase systems at the same voltage?
A. Three-phase system  D. Supply conductor
B. High power system  E. Balanced load
C. Single phase  F. None of the Above
171. In a three-phase system, ______________carry three alternating currents (which reach their instantaneous peak values at different times.
A. A balanced load  D. Instantaneous peak values
B. Single-phase  E. This delay between phases
C. Three circuit conductors  F. None of the Above

172. Taking one conductor as the reference, the other two currents are delayed in time by one-third and two-thirds of one cycle of the?
A. Neutral wire  D. Linear balanced load
B. Electric current  E. Lowest phase order
C. Four-phase system  F. None of the Above

173. Which of the following terms has the effect of giving constant power transfer over each cycle of the current and makes it possible to produce a rotating magnetic field in an electric motor?
A. This delay between phases  D. Linear balanced load
B. Three-phase circuits  E. The lowest phase order
C. Three-phase system  F. None of the Above

174. Three-phase systems may have a _________________.
A. Neutral wire  D. Linear balanced load
B. Three-phase circuits  E. The lowest phase order
C. One phase system  F. None of the Above

175. A hot wire allows the three-phase system to use a higher voltage while still supporting lower-voltage single-phase appliances.
A. True  B. False

176. ________________ is common not to have a neutral wire as the loads can simply be connected between phases.
A. High-voltage distribution situations  D. Linear balanced load
B. Three-phase circuits  E. The lowest phase order
C. Two-phase system  F. None of the Above

Three-phase has properties that make it very desirable in electric power systems:
177. The phase currents tend to assist one another, summing to zero in the case of a linear balanced load.
A. True  B. False

178. Power transfer into a ________________ is constant, which helps to reduce generator and motor vibrations.
A. Neutral wire  D. Linear balanced load
B. Three-phase circuits  E. Phase order
C. Three-phase system  F. None of the Above

179. Which of the following terms can produce a magnetic field that rotates in a specified direction, which simplifies the design of electric motors?
A. A balanced load  D. Instantaneous peak values
B. Single-phase  E. This delay between phases
C. Three-phase systems  F. None of the Above
180. Three is ___________ order to exhibit all of these properties.
A. The neutral wire  D. Linear balanced load
B. Three-phase circuits  E. The lowest phase order
C. Three-phase system  F. None of the Above

181. Most household loads are____________________ .
A. A balanced load  D. At instantaneous peak values
B. Single-phase  E. Between phases
C. Three-phase systems  F. None of the Above

3 Or 4 Wire
182. Which of the following terms occur in two varieties: three-wire and four-wire?
A. Instantaneous peak values  D. Linear balanced load
B. Three-phase circuits  E. The lowest phase order
C. Three-phase system  F. None of the Above

183. The three-wire system is used when the loads on the 3 live wires will be balanced, for example in motors or heating elements with____________________ .
A. A balanced load  D. Instantaneous peak values
B. Single-phase  E. 3 identical coils
C. Three-phase systems  F. None of the Above

184. The neutral wire is used when there is a chance that the?
A. Loads are not balanced  D. Linear balanced load
B. Three-phase circuits  E. Lowest phase order
C. Three-phase system  F. None of the Above

185. The '3-wire' and '4-wire' designations count the ground wire used on many transmission lines.
A. True  B. False

186. A three-phase induction motor has a simple design, inherently low starting torque.
A. True  B. False

187. A three-phase motor is more compact and less costly than a single-phase motor of the same voltage class and rating and single-phase DC motor.
A. True  B. False

188. Three-phase motors also vibrate less and hence last longer than single-phase motors of the same ____________used under the same conditions.
A. Rectifiers  D. Different phases
B. Power  E. Three-phase motor(s)
C. Large rectifier systems  F. None of the Above

189. Large types of loads do not require the revolving magnetic field characteristic of three-phase motors but take advantage of the higher voltage and power level usually associated with three-phase distribution.
A. True  B. False
190. Legacy single-phase fluorescent lighting systems also benefit from reduced flicker in a room if adjacent fixtures are powered from________________________.
   A. Rectifiers   D. Different phases
   B. Three-phase load   E. Three-phase motor(s)
   C. Large rectifier systems   F. None of the Above

191. Which of the following terms may have three-phase inputs; the resulting DC is easier to filter than the output of a single-phase rectifier?
   A. The neutral wire   D. Linear balanced load
   B. Three-phase circuits   E. Large rectifier systems
   C. Three-phase systems   F. None of the Above

192. Which of the following terms may be used for battery charging, electrolysis processes such as aluminum production or for operation of DC motors.
   A. Rectifiers   D. Different phases
   B. Three-phase load   E. Three-phase motor(s)
   C. Large rectifier systems   F. None of the Above

Phase Converters
193. Occasionally the advantages of three-phase motors make it worthwhile to convert single-phase power to?
   A. Many three-phase devices   D. A third "subphase"
   B. A three-phase generator   E. Three-phase
   C. A static phase converter   F. None of the Above

194. Which of the following terms goes to zero at each moment that the voltage crosses zero but three-phase delivers power continuously?
   A. Many three-phase devices   D. Single-phase power
   B. A three-phase generator   E. Many three-phase devices
   C. A static phase converter   F. None of the Above

195. One method for using three-phase equipment on a single-phase supply is with a rotary phase converter.
   A. True   B. False

196. A rotary phase converter essentially a three-phase motor with special starting arrangements and power factor correction that produces?
   A. A single-phase supply   D. The static converter
   B. Rectifier-type loads   E. Either DC or single-phase AC
   C. Balanced three-phase voltages   F. None of the Above

197. The usage of the main transformer method separated it from another common method, the static converter, as both methods have no moving parts, which separates them from the?
   A. A single-phase supply   D. The static converter
   B. Rectifier-type loads   E. Rotary converters
   C. Subphase   F. None of the Above

198. Another method often attempted is with a device referred to as?
   A. Many three-phase devices   D. A third "subphase"
   B. A three-phase generator   E. Many three-phase devices
   C. A static phase converter   F. None of the Above
199. A static phase converter method does not work when sensitive circuitry is involved such as CNC devices or in induction and _______________.
A. A single-phase supply  D. The static converter
B. Rectifier-type loads  E. Either DC or single-phase AC
C. Subphase  F. None of the Above

200. A three-phase generator can be driven by a?
A. Many three-phase devices  D. A third "subphase"
B. Three-phase generator  E. Single-phase motor
C. Static phase converter  F. None of the Above

201. ______________ can also form an uninterruptable power supply when used in conjunction with a large flywheel and a standby generator set.
A. A single-phase supply  D. The static converter
B. Rectifier-type loads  E. The motor-generator method
C. Subphase  F. None of the Above

202. Some devices are made which create an imitation three-phase from_____________.
A. Three-wire single-phase  D. A third "subphase"
B. A three-phase generator  E. Many three-phase devices
C. A static phase converter  F. None of the Above

203. Which of the following terms can run on this imitation three-phase configuration but at lower efficiency?
A. Many three-phase devices  D. A third "subphase"
B. A three-phase generator  E. Many three-phase devices
C. A static phase converter  F. None of the Above

204. Variable-frequency drives are used to provide precise speed and torque control of three-phase motors, and some models can be powered by?
A. A single-phase supply  D. The static converter
B. Rectifier-type loads  E. Either DC or single-phase AC
C. Subphase  F. None of the Above

205. Which of the following terms work by converting the supply voltage to DC and then converting the DC to a suitable three-phase source for the motor.
A. Many three-phase devices  D. A third "subphase"
B. A three-phase generator  E. Many three-phase devices
C. VFDs  F. None of the Above

206. _______________ are designed for fixed-frequency operation from a single-phase source.
A. A single-phase supply  D. The static converter
B. Rectifier-type loads  E. Either DC or single-phase AC
C. Digital phase converters  F. None of the Above
Alternatives to Three-Phase
207. Which of the following terms is used when three-phase power is not available and allows double the normal utilization voltage to be supplied for high-power loads?
A. Two-phase  D. Three-phase power
B. Split-phase electric power  E. Electromagnetic Induction
C. Direct current  F. None of the Above

208. According to the text, loads that connect each phase to neutral, assuming the load is the same power draw, the two-wire system has a neutral current which is greater than neutral current in?
A. A circuit  D. Electromagnet Induction
B. A three-phase system  E. Direct current
C. Voltage  F. None of the Above

209. Some motors are not entirely linear, motors running on three-phase tend to run smoother than those on__________________.
A. Two-phase  D. Three-phase power
B. Polarity  E. Electromagnetic Induction
C. Direct current  F. None of the Above

210. High-phase-order transmission lines may allow transfer of more power through a given transmission line right-of-way without the expense of a high-voltage direct current converter at each end of the line.
A. True  B. False

Direct Current versus Alternation Current
211. Direct current flows in one direction only.
A. True  B. False

212. Direct current flows on an oscilloscope screen it always appears on one side of the zero axis, because?
A. Two-phase power  D. Its polarity does not change
B. Polarity  E. Electromagnetic Induction
C. Direct current  F. None of the Above

213. According to the text, batteries produce steady?
A. DC  D. Electromagnet Induction
B. AC  E. Directional current
C. Voltage  F. None of the Above

214. Which of the following terms does change in magnitude, but always appears on the same side of the zero axis on an oscilloscope?
A. Pulsating DC  D. Three-phase power
B. Polarity  E. Electromagnetic Induction
C. Direct current  F. None of the Above

215. On an oscilloscope the voltage and current appear on both sides of the zero axis, as ____________ alternates and the current changes direction.
A. A circuit  D. The polarity of the voltage
B. AC  E. Direct current
C. Voltage  F. None of the Above
Electromagnet Induction
216. Electromagnetic Induction is the ability of a magnetic field to generate a voltage or current in a conductor with physical contact.
A. True  B. False

217. Alternating current is generated through an electrical effect called?
A. Two-phase  D. Three-phase power
B. Polarity  E. Electromagnetic Induction
C. Direct current  F. None of the Above

218. Which of the following flows in the circuit, when the conductor becomes part of a circuit?
A. Current  D. Electromagnet Induction
B. AC  E. Direct current
C. Voltage  F. None of the Above

219. According to the text, as the coils are turned through a rotational magnetic, voltage is generated, this converts rotational motion into?
A. AC  D. Energy
B. Current flow  E. Electromagnetic Induction
C. Direct current  F. None of the Above

220. AC motors also depend upon electromagnetic induction converting _______ into rotational motion.
A. Current flow  D. Electromagnet Induction
B. AC  E. Direct current
C. Voltage  F. None of the Above

221. The conductor and the ____________ are not physically connected, yet a voltage is induced in the conductor when the conductor moves through the magnetic field, or when the magnetic field moves through the conductor.
A. Magnetic field  D. Three-phase power
B. Polarity  E. Electromagnetic Induction
C. Direct current  F. None of the Above

Sine Wave for AC
222. Alternating voltage and current generated by rotary motion take the form of a sine wave.
A. True  B. False

Sine waves are measured and compared by certain features.
223. In each cycle, there are one reversal and three maximums.
A. True  B. False

224. The amplitude of the sine wave tells you the maximum value of current or?
A. Sine wave  D. Voltage
B. Amplitude  E. AC
C. A horizontal line  F. None of the Above
225. A cycle is one complete repetition of the wave form; it is produced by one complete revolution-360°-of the conductor through the _________________.
A. Each cycle D. Voltage or current
B. Magnetic field E. Positive current and voltage
C. AC F. None of the Above

226. Which of the following terms peaks in the positive direction at 90°, crosses the zero axis at 180°, peaks in the negative direction at 270°, then reaches zero again at 360°?
A. Sine wave D. Maximum value of current or voltage
B. Amplitude E. AC
C. A horizontal line F. None of the Above

227. ________________ is generated at 60 cycles or 50 cycles per second.
A. Each cycle D. Voltage or current
B. Magnetic field E. Hertz
C. Most AC F. None of the Above

228. Two waves can have the same amplitude and frequency, the same amplitude but different frequency, and different amplitude and different?
A. Sine wave D. Maximum value of current or voltage
B. Amplitude E. Frequency
C. Horizontal line F. None of the Above

229. According to the text, the Peak to Peak voltage is the voltage measured between the maximum positive and maximum negative points on the sine wave, it is twice the?
A. Sine wave D. Hertz
B. Amplitude E. AC
C. A horizontal line F. None of the Above

230. RMS voltage or current is a standard means of measuring _________________.
A. Each cycle D. Hertz
B. Magnetic field E. Positive current and voltage
C. Alternating current F. None of the Above

231. Negative current and voltage do the same amount of work as positive voltage and current.
A. True B. False

Transformers
232. Makes AC power transmission and distribution possible and transform values of voltage and current.
A. True B. False

233. Transformers operate on the principle of _________________.
A. Tesla’s principles D. Electromagnetic induction
B. Secondary coil E. One voltage from another
C. Primary winding F. None of the Above
234. Transformers usually transfer _____________ from one circuit to another.
A. AC voltages D. Expanding magnetic field
B. DC E. Secondary voltage
C. Energy F. None of the Above

235. Which of the following terms are designed either to step voltage up or to step it down?
A. Most transformers D. Frequencies
B. Step down convertor E. Expanding magnetic fields
C. Primary windings F. None of the Above

236. Transformers work because electric current generates a magnetic field around an electrical conductor to the earth.
A. True B. False

237. The magnetic field is constant, if the current flow is steady, as with?
A. AC voltages D. Expanding magnetic field frequencies
B. DC E. Secondary voltage
C. A common winding F. None of the Above

238. Which of the following terms consist of a primary winding or coil connected to the source circuit and a secondary winding connected to the load circuit?
A. Transformers D. Electromagnetic induction
B. EMF E. Frequencies
C. Primary windings F. None of the Above

239. _______________ flows through the primary, the collapsing and expanding magnetic field induces a voltage and current in the secondary as the lines of force keep cutting through the secondary coil windings.
A. AC D. Expanding magnetic fields
B. DC E. Secondary voltage
C. A common winding F. None of the Above

240. With each turn of wire in the, primary coil has an equal share at the primary voltage across it and the same ______________ is induced in each turn of the secondary coil.
A. Transformer D. Electromagnetic induction
B. Voltage E. Frequency
C. Primary winding F. None of the Above

241. If each turn in the secondary coil has 8 volts across it, each turn in the primary will also have 4 volts across it.
A. True B. False

**Step-Down Transformers**

242. If there are fewer turns in the secondary, the ______________ will be lower than the primary.
A. Transformer D. Secondary voltage
B. Secondary coil E. Primary coil
C. Primary winding F. None of the Above
Step-Up Transformers
243. If there are more turns in the secondary coil than in the __________, voltage will be higher on the secondary circuit.
A. Transformer   D. Secondary voltage
B. Secondary coil  E. Ground
C. Primary   F. None of the Above

Autotransformers
244. In Autotransformers, the primary and secondary share?
A. AC voltages   D. Expanding magnetic field
B. DC   E. Secondary voltage
C. A common winding   F. None of the Above

245. The part of the winding connected to the source is the?
A. Transformer   D. Secondary voltage
B. Secondary coil  E. Primary coil
C. Primary winding   F. None of the Above

246. The part of the winding connected to the load is the ______________.
A. Secondary winding   D. Secondary voltage
B. Secondary coil  E. Primary coil
C. Primary winding   F. None of the Above

247. Which of the following terms can be tapped at any point to form either the primary or the secondary portion of the winding?
A. Transformer   D. Winding
B. Secondary coil  E. Primary coil
C. Primary winding   F. None of the Above

248. The location of the tap determines the number of turns in the?
A. Transformer   D. Primary or secondary windings
B. Secondary coil  E. Primary coil
C. Primary winding   F. None of the Above

Line Loss
249. Whenever power is sent over transmission lines, the resistance of the lines results in power lost in ________________.
A. Edison system   D. The form of resistance
B. The form of heat   E. A 120/240-volt system
C. Second load   F. None of the Above

250. At the generating station step-up transformers are used to raise voltage to extremely high levels, sometimes more than 100,000 volts
A. True   B. False

251. Step-down transformers reverse the process at substations and service drops, lowering the ________________ back to usable levels.
A. Hot wires   D. The form of 3-phase AC
B. Voltage   E. Three-phase electricity
C. Current   F. None of the Above
3-Phase Power
252. Which of the following terms is distributed in the form of 3-phase AC?
A. Most power D. Ohms
B. Voltage E. Three-phase electricity
C. Current F. None of the Above

253. According to the text, as the coils turn through the magnetic field, power is sent out on?
A. Three lines D. The third wire
B. The form of heat E. A 120/240-volt system
C. Current F. None of the Above

254. ________________ is needed, it is available between any two phases, or, in some systems, between one of the phases and ground.
A. Single-phase electricity D. The form of 3-phase AC
B. Voltage E. Three-phase electricity
C. Current F. None of the Above

The Edison System
255. The 3-wire Edison System has one hot conductor, and two grounded neutral conductors.
A. True B. False

256. In a 120/240-volt system, the __________ between each hot wire and neutral is 120 volts.
A. Second load D. Ground
B. Voltage E. Neutral
C. Current F. None of the Above

257. Which of the following terms between the two hot wires is 240 volts?
A. Second load D. Amps
B. Voltage E. Ohms
C. Current F. None of the Above

258. The lower the voltage to ground in any electrical system, the less likely are shorts, fires, and shocks.
A. True B. False

Balanced and Unbalanced Loads on the Edison System
259. The same current flows in each hot wire when loads are balanced, that is, when they have the same ________________ .
A. Hot wires D. Resistance
B. Voltage E. Hertz
C. Current F. None of the Above

260. When loads are not balanced-the ___________ of one is greater than the other-current flows in the neutral.
A. Hot wires D. Resistance
B. Voltage E. Three-phase electricity
C. Current F. None of the Above
System Grounding

261. Most electrical supply systems, _____________, are grounded at some point as a safety measure.
A. Hot conductors  D. An electrical conductor to the earth
B. Both AC and DC  E. Grounding wire(s)
C. Load current  F. None of the Above

262. All conductors or metal parts-conduit, ground busses -which are connected to ground at some point have _____________ on them with respect to ground.
A. Grounded conductors  D. Ground connection
B. GFI  E. Zero voltage
C. Safety devices  F. None of the Above

263. According to the text, in grounded systems, insulation faults or shorts to ground on _____________ will carry high current and blow fuses or trip breakers.
A. Hot conductors  D. An electrical conductor to the earth
B. No resistance  E. Grounding wire(s)
C. Load current  F. None of the Above

264. Which of the following terms or short to ground on a hot conductor may not open a fuse or breaker, or affect system operation at all?
A. Grounded conductors  D. Ground connection
B. An insulation fault  E. Zero voltage
C. Grounding Wire  F. None of the Above

265. The short to ground on the hot conductors has grounded the system there, and reversed the hot and the supposedly grounded parts of it.
A. True  B. False

266. It is essential to recognize the difference between a _____________ and a Grounding Wire.
A. Grounded conductor  D. Ground connection
B. 3-wire Edison system ground  E. Zero voltage jumper
C. Grounding Wire fault  F. None of the Above

267. Which of the following terms is any conductor that is grounded at the source and carries load current?
A. Grounded conductor  D. Ground connection
B. 3-wire Edison system ground  E. Zero voltage jumper
C. Grounding Wire fault  F. None of the Above

268. The neutral in a 3-wire Edison system is a?
A. Grounded conductor  D. Ground connection
B. Fault  E. Zero voltage jumper
C. Grounding Wire fault  F. None of the Above

269. _____________ developed in its connections, anything connected to ground by it would have voltage on it.
A. Hot conductors  D. Resistance
B. No resistance  E. Grounding wire(s)
C. Load current  F. None of the Above
270. Which of the following terms are usually insulated, since there is the possibility of voltage on them in case of a bad connection?
A. Grounded conductors  D. Ground connection
B. Fault  E. Zero voltage jumper
C. Grounding Wire fault  F. None of the Above

271. A Grounding Wire connects current-carrying metal parts of equipment to ground.
A. True  B. False

272. A Grounding Wire will not have current when a fault occurs, and then only briefly until a fuse blows or breaker resets.
A. True  B. False

273. Some installations include a grounding rod driven into the earth. Neither a grounding wire nor a grounded conductor must ever be fused, switched, or broken in any way.
A. True  B. False

274. The connection to ground must be secure and?
A. Hot conductors  D. An electrical conductor to the earth
B. Grounded conductors  E. Permanent
C. Often uninsulated  F. None of the Above

Powering Single-Phase Loads from 3-Phase Systems
275. Any 3-phase system has single-phase voltage between the powerlines that can be used to power single-phase loads at line-to-line voltage, or at some other voltage if a?
A. Three-phase transformer  D. Single-phase loads
B. 3-wire Edison system  E. Single-phase transformer
C. Grounding Wire  F. None of the Above

Four-Wire Wye
276. ______________ can be connected between any powerline and the grounded neutral.
A. Three-phase transformer  D. Single-phase loads
B. 3-wire Edison system  E. Single-phase transformer
C. Grounding Wire  F. None of the Above

Four-Wire Delta
277. A four-wire delta system has a grounded neutral conductor connected to a center tap on one ________________.
A. Grounded neutral  D. Jumper
B. Terminals or leads  E. Single-phase loads
C. Secondary winding  F. None of the Above

278. Which of the following terms equal to half of the line-to-line voltage is available between the powerline on either end of that winding and the grounded neutral?
A. Grounded neutral  D. Single-phase voltage
B. Terminals or leads  E. Single-phase loads
C. Secondary winding  F. None of the Above
279. Which of the following terms between the other phase conductor and the grounded neutral will be considerably higher than half line-to-line voltage?
A. Phase  
B. Terminals or leads  
C. Polarity  
D. Jumper  
E. Voltage  
F. None of the Above

280. If there is no neutral conductor, do not attempt to connect a single-phase load between one of the phase conductors and ground!
A. True  
B. False

281. ________________ should be balanced between the lines as much as possible if single-phase loads are to be powered correctly.
A. Single-phase power  
B. Single-phase voltage  
C. Polarity  
D. Three-phase system  
E. Single-phase loads  
F. None of the Above

282. A grounded neutral is perfectly balanced and the current in the neutral will be zero if ________________ connected between the phase lines?
A. Single-phase power  
B. Single-phase voltage  
C. Polarity  
D. Three-phase system  
E. Single-phase loads  
F. None of the Above

Connecting Loads
283. There are usually just two supply terminals or leads to most lights and these lights require?
A. Single-phase power  
B. Single-phase voltage  
C. Polarity  
D. Three-phase system  
E. Single-phase loads  
F. None of the Above

284. Single-phase power is one black wire, designated for the hot conductor and the other, white or grey or green for grounded neutral.
A. True  
B. False

285. Industrial heaters, ovens, and dryers, may require single or three-phase power.
A. True  
B. False

286. According to the text, small, single speed, single-phase motors can operate on either 115 or 230 volts by connecting different terminals, or by adding or removing a ________________ .
A. Phase  
B. Terminal or lead  
C. Polarity  
D. Jumper  
E. Single-phase load  
F. None of the Above

287. According to the text, if there is a choice of which voltage to use, connect the motor for 230 volts; it will draw only half as much current at the ________________ .
A. Higher voltage  
B. Current in the neutral  
C. Single-phase power  
D. Single-phase voltage  
E. One conductor will be grounded  
F. None of the Above
288. Which of the following terms usually makes no difference; the motor will run equally well and in the same direction with the leads reversed?
A. Phase  
B. Terminals or leads  
C. Polarity  
D. Jumper  
E. Single-phase loads  
F. None of the Above

289. If connected for 115 volts, one conductor will be grounded, ___________may be designated for the grounded conductor because of the way the motor is insulated.
A. Phase-to-ground voltage(s)  
B. Current in the neutral  
C. Single-phase power  
D. One of the leads or terminals  
E. One conductor will be grounded  
F. None of the Above

290. Which of the following terms represents motors may have six or more terminals or leads?
A. Single-phase power  
B. Single-phase voltage  
C. Multiple speed single-phase  
D. Three-phase  
E. Single-phase loads  
F. None of the Above

291. _____________ motors must have three properly sequenced voltages of the correct polarity.
A. Single-phase power  
B. Single-phase voltage  
C. Multiple speed single-phase  
D. Three-phase  
E. Single-phase  
F. None of the Above

292. _____________ induction motors are dual voltage units?
A. Single-phase power  
B. Single-phase voltage  
C. Multiple speed single-phase  
D. Three-phase  
E. Single-phase  
F. None of the Above

**Series Circuit**

293. In a series circuit, the components are connected end-to-end, so that all the electrons that leave the source in a current pass through all the components, one after the other, before returning to the source.
A. True  
B. False

294. In a series circuit current, in _____________, flows through all the loads.
A. Ohm's Law  
B. Not affected  
C. The current  
D. Ampere(s)  
E. Resistance(s)  
F. None of the Above

295. When a switch is opened, or when one of the loads burns out; all the loads will stop working, since there is no way for the _____________ to complete the circuit back to the source.
A. Ohms  
B. Volts  
C. Current  
D. Ampere(s)  
E. Resistance(s)  
F. None of the Above

296. The resistance of a series circuit is the sum of the _____________ of all the loads.
A. Ohms  
B. Volts  
C. Current  
D. Ampere(s)  
E. Resistance  
F. None of the Above
Parallel Circuits
Loads are normally arranged in parallel with each other:

297. Which of the following terms can operate and be controlled individually, if one load burns out the others are not affected?
A. Ohms  D. Ampere(s)
B. Loads  E. Resistance(s)
C. The current  F. None of the Above

298. The voltage across each load is source voltage, so each load receives the voltage it requires. The current in each branch is determined by the resistance of the load in that particular branch.
A. True  B. False

Equivalent Circuits

299. Complex circuits include components in both series and parallel, to properly figure fuse or conductor size, it is often necessary to find the total?
A. Ohms  D. Ampere(s)
B. Volts  E. Amperage
C. Current  F. None of the Above

300. You will need to convert the equivalent conductance back into a resistance before adding it to the resistance of another component in series.
A. True  B. False

You are finished with the assignment. Please fax or email the registration page and answer key to us and call us a few hours later to ensure that we received it.