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Basic Electricity CEU Course Answer Key

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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 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

- Electrically charged matter is influenced by and produces electromagnetic fields.
A. True B. False
- 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
- 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
- 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
- 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
- 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
- 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
 - B. Electric charge
 - C. Charged matter
 - D. Electrical current(s)
 - E. Electromagnetic field(s)
 - 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
 - B. Electricity
 - C. Electrical current
 - D. Conduction
 - E. Ampere(s)
 - 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
 - B. Chemical energy
 - C. Electrical current
 - D. Hertz
 - E. Ampere(s)
 - F. None of the Above

Joules

13. According to the text, a thousand joules is equal to?
- A. 100 Amps
 - B. 100 horsepower
 - C. A British thermal unit
 - D. 100 Hertz
 - E. Kinetic energy
 - 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
 - B. Good insulators
 - C. Energy storage
 - D. A viable source of electricity
 - E. A variety of heat sources
 - F. None of the Above
15. Which of the following terms measures how well something conducts electricity?
- A. Electron(s)
 - B. Conductor(s)
 - C. Its resistance
 - D. Electrical energy
 - E. Kinetic energy
 - F. None of the Above
16. Rubber, plastic, cloth, glass and dry air are good insulators and have?
- A. An electrical current
 - B. Good insulators
 - C. Energy storage potential
 - D. Very high resistance
 - E. A variety of heat sources
 - 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
- B. Kilovolt Ampere
- C. Watt
- D. Ohm
- E. Power Factor
- F. None of the Above

26. Which of the following terms is a unit of resistance?

- A. Volt
- B. Ampere
- C. Watt
- D. Ohm
- E. Static electricity
- F. None of the Above

27. Power Factor - ratio of watts to?

- A. Volt
- B. Kilovolt Ampere
- C. Volt amperes
- D. Ohm
- E. Power Factor
- F. None of the Above

28. Which of the following terms are units of current?

- A. Volt
- B. Kilovolt Ampere
- C. Watt
- D. Ohm
- E. Ampere
- F. None of the Above

29. Which of the following terms is a unit of electrical energy or power?

- A. Volt
- B. Ampere
- C. Watt
- D. Ohm
- E. Static electricity
- 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
- B. Kilovolt Ampere
- C. Watt
- D. Volt Ampere
- E. Power Factor
- F. None of the Above

31. According to the text, a Kilovolt Ampere - one kilovolt ampere is equal to ?

- A. 500 Volts
- B. 100 Amperes
- C. 1,000 Watt
- D. KVA
- E. Kilovolt Ampere
- 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
- B. Finds resistance
- C. Release
- D. Current electricity
- E. Electrical discharge
- 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
 - B. Amperes
 - C. Wattage
 - D. Current electricity
 - E. Static electricity
 - F. None of the Above

Contact-induced Charge Separation

35. Which of the following terms can be exchanged between materials on contact?
- A. Gravitation
 - B. Electron(s)
 - C. The triboelectric effect
 - D. A separation of charge
 - E. Piezoelectric charge
 - F. None of the Above
36. _____ is the main cause of static electricity as observed in everyday life.
- A. Electric conflict
 - B. Tesla effect
 - C. The triboelectric effect
 - D. A separation of charges
 - E. Piezoelectric
 - F. None of the Above
37. Which of the following terms causes your hair to stand up and causes static cling?
- A. Piezoelectric effect
 - B. Electron(s)
 - C. The triboelectric effect
 - D. A separation of charge
 - E. Contact-induced charge separation
 - 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
 - B. Magnetism
 - C. A positive current
 - D. The electric conflict
 - E. Electrolysis
 - 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
 - B. Speed of light
 - C. Electromagnetic current
 - D. Electrical conduction
 - E. Electric power
 - 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
- B. Rubber diaphragm
- C. Flow meter
- D. Hydraulic volume flow rate
- E. Flowing water
- 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
- B. Voltage in a capacitor
- C. Force of gravity
- D. A needle valve
- E. Section of pipe
- F. None of the Above

66. According to the text, an inductor is a heavy paddle wheel placed in?

- A. Valve assembly
- B. Potential difference
- C. Feedback control
- D. A positive displacement pump
- E. The current
- 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
- B. Quantity of water
- C. Water level
- D. The mass and surface area of the wheel
- E. Capacitor
- 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
- B. Potential difference
- C. Feedback control
- D. A positive displacement pump
- E. Water flow
- 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
- B. Quantity of water
- C. Water level
- D. The mass and surface area of the wheel
- E. A large body of water at a high elevation
- 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
- B. Quantity of water
- C. Water level
- D. The mass and surface area of the wheel
- E. Some resistance to flow
- F. None of the Above

72. Voltage is also called voltage drop or?

- A. Valve assembly
- B. Potential difference
- C. Feedback control
- D. A positive displacement pump
- E. Water flow
- 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
- B. Pressure
- C. Electric potential
- D. Voltage
- E. Charge
- 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
- B. Voltage
- C. Electromotive force
- D. A static (unchanging) electric field
- E. Electric potential difference
- F. None of the Above

87. Which of the following terms is now obsolete but tension is still used?

- A. Energy
- B. Pressure
- C. Electric potential
- D. Voltage
- E. Charge
- F. None of the Above

88. _____ is defined so that negatively charged objects are pulled towards higher voltages.

- A. Electric current
- B. Voltage
- C. Electromotive force
- D. A static (unchanging) electric field
- E. Electric potential difference
- 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
- B. Pressure
- C. Current
- D. Voltage
- E. Charge
- F. None of the Above

90. Which of the following terms is not the only factor determining charge flow?

- A. Electric field
- B. Voltage
- C. Electromotive force
- D. Resistance
- E. Electric potential difference
- 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
- B. Electrical energy
- C. Magnetic field strength
- D. Magnetic flux in the loop constant
- E. Lorentz force
- 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
- B. EMF
- C. Size of the charge
- D. Electrically conductive liquids and slurries
- E. Amperes
- F. None of the Above

102. In those materials with high _____ few electrons will move.

- A. Amps
- B. Current
- C. Potential difference
- D. Resistance
- E. Volts
- F. None of the Above

103. Resistance is measured in _____ and is designated by the symbol Ω (omega).

- A. Ohms
- B. EMF
- C. Size of the charge
- D. Potential difference
- E. Amperes
- F. None of the Above

Measuring Resistance

104. The symbol "V" is used to represent something called the?

- A. Electron(s)
- B. Current
- C. Potential difference
- D. Resistance
- E. Amperes
- 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
- B. EMF
- C. Size of the charge
- D. Potential difference
- E. Amperes
- 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)
- B. Current
- C. Potential difference
- D. Resistance
- E. Volts
- F. None of the Above

107. Current is measured in amperes and resistance is measured in _____ .

- A. Ohms
- B. EMF
- C. Size of the charge
- D. Electrically conductive liquids and slurries
- E. Amperes
- 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
- B. EMF
- C. Size of the charge
- D. Resistance
- E. Amperes
- F. None of the Above

109. Current is directly proportional to?

- A. Electron(s)
- B. Current
- C. Potential difference
- D. Voltage
- E. Volts
- 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
- B. Classical mechanics
- C. Its resistivity
- D. Proportional to the potential difference
- E. Electrical conductance
- F. None of the Above

111. Which of the following terms shares some conceptual parallels with the mechanical notion of friction?

- A. Conductance
- B. Electrical resistance
- C. Electric field vector
- D. Infinity
- E. Current
- F. None of the Above

112. All materials show some resistance, except for superconductors, which have a?

- A. The voltage difference
- B. Resistance of zero
- C. Its resistivity
- D. Proportional to the potential difference
- E. The charge is negative
- 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
- B. Electrical resistance
- C. Electric field vector
- D. Infinity
- E. Current
- 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
- B. Positive charge
- C. Its resistivity
- D. Proportional to the potential difference
- E. Charge is negative
- 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
- B. Electrical resistance
- C. Electric field vector
- D. The magnitude of the force
- E. Current
- 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
- B. Classical mechanics
- C. Its resistivity
- D. Proportional to the potential difference
- E. The charge is negative
- F. None of the Above

117. Which of the following terms at infinity is assumed to be zero?

- A. Conductance
- B. Electrical resistance
- C. Electric field vector
- D. The electric potential
- E. Current
- 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
- B. Voltage Drop
- C. Its resistivity
- D. Proportional to the potential difference
- E. The charge is negative
- 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
- B. Electrical resistance
- C. Electric field vector
- D. Infinity
- E. Current
- 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
- B. Electrical resistance
- C. Its resistivity
- D. Is not proportional to the potential difference
- E. Is proportional to the potential difference
- 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
- B. Electrical resistance
- C. Electric field vector
- D. Ground potential
- E. Current
- 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
- B. Junction
- C. Resistivity
- D. Potential difference
- E. The charge is negative
- 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
- B. Capacitance
- C. Negative
- D. An electric field
- E. Direct current
- 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
- B. Test charge
- C. Electric field
- D. Alternating current
- E. Energy in first one direction
- 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
- B. Capacitance
- C. Negative
- D. An electric field
- E. A conductor
- 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
- B. Test charge
- C. Electric field
- D. An alternating current
- E. Energy in first one direction
- 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
- B. Capacitance
- C. Negative
- D. An electric field
- E. Gravity
- F. None of the Above

129. These properties are important when circuitry is subjected to _____, such as when first energized.

- A. Lines of force
- B. Test charge
- C. Electric field
- D. Transients
- E. Energy in first one direction
- 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
- B. Capacitance
- C. Negative field
- D. An electric field
- E. Gravity
- 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
- B. Test charge
- C. Electric field
- D. Gravitational field acts
- E. Energy in first one direction
- 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
- B. Capacitance
- C. Negative
- D. An electric field
- E. Gravity
- F. None of the Above

133. Which of the following terms at a distance is usually zero?

- A. Lines of force
- B. Test charge
- C. Electric field
- D. Transients
- E. Energy in first one direction
- 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
- B. Capacitance
- C. Negative
- D. An electric field
- E. Gravity
- 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
- B. Test charge
- C. Electric field
- D. Transients
- E. Energy in first one direction
- 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
- B. Capacitance
- C. Negative
- D. An electric field
- E. A vector field
- 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
- B. Test charge
- C. Electric field
- D. Field lines
- E. Energy in first one direction
- 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
- B. Electric field strength
- C. Electrical breakdown
- D. This principle
- E. The charge
- F. None of the Above

141. Which of the following terms are important when designing items of high-voltage equipment?

- A. Outside electrical effects
- B. Electric field strength
- C. Electrical breakdown
- D. This principle
- E. The principles of electrostatics
- 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
- B. Electric strength
- C. 100 amps
- D. 10,000 volts
- E. 1,000 volts
- 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
- B. Electric field strength
- C. Electrical breakdown
- D. Potential of the surface
- E. Faraday cage
- 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
- B. Force
- C. Electric potential difference
- D. Electrically uncharged—and unchargeable
- E. The concept of electric potential
- 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
- B. An electric field
- C. Potential
- D. An infinite distance
- E. Potential of the surface
- 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
- B. Force and voltage
- C. Electric potential difference
- D. Electrically uncharged—and unchargeable
- E. Two potentials of the surface
- 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
- B. Potential of the surface
- C. Potential
- D. Earth
- E. An electric field
- 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
- B. Force
- C. Electric potential difference
- D. Electrically charged
- E. Potential of the surface
- 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
- B. An electric field
- C. Potential
- D. Earth ground
- E. Potential of the surface
- 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
- B. Positive and negative charge
- C. Electric potential difference
- D. Power
- E. Potential
- 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
- B. The electric field
- C. Potential
- D. Negative charge
- E. Potential of the surface
- 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
- B. Force
- C. Electric potential difference
- D. Electrically uncharged—and unchargeable
- E. Potential of the surface
- 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
- B. High power systems
- C. Double phase
- D. The waveforms of the three supply conductors
- E. Single-phase electric power
- 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
- B. Three phase(s)
- C. Poly-phase distribution
- D. Double-phase power distribution
- E. Single-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
- B. High power systems
- C. A single-phase supply
- D. The waveforms of the three supply conductors
- E. Voltages of the supply vary in unison
- 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
- B. Three phase(s)
- C. Poly-phase distribution
- D. Double-phase power distribution
- E. Single-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
- B. High power systems
- C. Single phase
- D. The waveforms
- E. Voltages of the supply vary in unison
- 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
- B. Three phase(s)
- C. Poly-phase distribution
- D. Soft start
- E. Squirrel cage
- 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
- B. High power systems
- C. Single phase
- D. The waveforms of the three supply conductors
- E. Voltages of the supply vary in unison
- 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
- B. Three phase(s)
- C. Poly-phase distribution
- D. Single-phase power distribution
- E. Balanced load
- 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
- B. High power system
- C. Single phase
- D. Supply conductor
- E. Balanced load
- 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
- B. Single-phase
- C. Three circuit conductors
- D. Instantaneous peak values
- E. This delay between phases
- 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
- B. Electric current
- C. Four-phase system
- D. Linear balanced load
- E. Lowest phase order
- 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
- B. Three-phase circuits
- C. Three-phase system
- D. Linear balanced load
- E. The lowest phase order
- F. None of the Above

174. Three-phase systems may have a _____.

- A. Neutral wire
- B. Three-phase circuits
- C. One phase system
- D. Linear balanced load
- E. The lowest phase order
- 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
- B. Three-phase circuits
- C. Two-phase system
- D. Linear balanced load
- E. The lowest phase order
- 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 out 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
- B. Three-phase circuits
- C. Three-phase system
- D. Linear balanced load
- E. Phase order
- 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
- B. Single-phase
- C. Three-phase systems
- D. Instantaneous peak values
- E. This delay between phases
- 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
- B. Three-phase load
- C. Large rectifier systems
- D. Different phases
- E. Three-phase motor(s)
- 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
- B. Three-phase circuits
- C. Three-phase systems
- D. Linear balanced load
- E. Large rectifier 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
- B. Three-phase load
- C. Large rectifier systems
- D. Different phases
- E. Three-phase motor(s)
- 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
- B. A three-phase generator
- C. A static phase converter
- D. A third "subphase"
- E. Three-phase
- 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
- B. A three-phase generator
- C. A static phase converter
- D. Single-phase power
- E. Many three-phase devices
- 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
- B. Rectifier-type loads
- C. Balanced three-phase voltages
- D. The static converter
- E. Either DC or single-phase AC
- 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
- B. Rectifier-type loads
- C. Subphase
- D. The static converter
- E. Rotary converters
- F. None of the Above

198. Another method often attempted is with a device referred to as?

- A. Many three-phase devices
- B. A three-phase generator
- C. A static phase converter
- D. A third "subphase"
- E. Many three-phase devices
- 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
- B. Rectifier-type loads
- C. Subphase
- D. The static converter
- E. Either DC or single-phase AC
- F. None of the Above

200. A three-phase generator can be driven by a?

- A. Many three-phase devices
- B. Three-phase generator
- C. Static phase converter
- D. A third "subphase"
- E. Single-phase motor
- 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
- B. Rectifier-type loads
- C. Subphase
- D. The static converter
- E. The motor-generator method
- F. None of the Above

202. Some devices are made which create an imitation three-phase from _____ .

- A. Three-wire single-phase
- B. A three-phase generator
- C. A static phase converter
- D. A third "subphase"
- E. Many three-phase devices
- 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
- B. A three-phase generator
- C. A static phase converter
- D. A third "subphase"
- E. Many three-phase devices
- 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
- B. Rectifier-type loads
- C. Subphase
- D. The static converter
- E. Either DC or single-phase AC
- 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
- B. A three-phase generator
- C. VFDs
- D. A third "subphase"
- E. Many three-phase devices
- F. None of the Above

206. _____ are designed for fixed-frequency operation from a single-phase source.

- A. A single-phase supply
- B. Rectifier-type loads
- C. Digital phase converters
- D. The static converter
- E. Either DC or single-phase AC
- 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
- B. Split-phase electric power
- C. Direct current
- D. Three-phase power
- E. Electromagnetic Induction
- 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
- B. A three-phase system
- C. Voltage
- D. Electromagnet Induction
- E. Direct current
- 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
- B. Polarity
- C. Direct current
- D. Three-phase power
- E. Electromagnetic Induction
- 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
- B. Polarity
- C. Direct current
- D. Its polarity does not change
- E. Electromagnetic Induction
- F. None of the Above

213. According to the text, batteries produce steady?

- A. DC
- B. AC
- C. Voltage
- D. Electromagnet Induction
- E. Directional current
- 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
- B. Polarity
- C. Direct current
- D. Three-phase power
- E. Electromagnetic Induction
- 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
- B. AC
- C. Voltage
- D. The polarity of the voltage
- E. Direct current
- 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
- B. Magnetic field
- C. AC
- D. Voltage or current
- E. Positive current and voltage
- 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
- B. Amplitude
- C. A horizontal line
- D. Maximum value of current or voltage
- E. AC
- F. None of the Above

227. _____ is generated at 60 cycles or 50 cycles per second.

- A. Each cycle
- B. Magnetic field
- C. Most AC
- D. Voltage or current
- E. Hertz
- 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
- B. Amplitude
- C. Horizontal line
- D. Maximum value of current or voltage
- E. Frequency
- 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
- B. Amplitude
- C. A horizontal line
- D. Hertz
- E. AC
- F. None of the Above

230. RMS voltage or current is a standard means of measuring _____ .

- A. Each cycle
- B. Magnetic field
- C. Alternating current
- D. Hertz
- E. Positive current and voltage
- 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
- B. Secondary coil
- C. Primary winding
- D. Electromagnetic induction
- E. One voltage from another
- F. None of the Above

234. Transformers usually transfer _____ from one circuit to another.

- A. AC voltages
- B. DC
- C. Energy
- D. Expanding magnetic field
- E. Secondary voltage
- 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
- B. Step down convertor
- C. Primary windings
- D. Frequencies
- E. Expanding magnetic fields
- 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
- B. DC
- C. A common winding
- D. Expanding magnetic field frequencies
- E. Secondary voltage
- 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
- B. EMF
- C. Primary windings
- D. Electromagnetic induction
- E. Frequencies
- 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
- B. DC
- C. A common winding
- D. Expanding magnetic fields
- E. Secondary voltage
- 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
- B. Voltage
- C. Primary winding
- D. Electromagnetic induction
- E. Frequency
- 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
- B. Secondary coil
- C. Primary winding
- D. Secondary voltage
- E. Primary coil
- 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
- B. Secondary coil
- C. Primary
- D. Secondary voltage
- E. Ground
- F. None of the Above

Autotransformers

244. In Autotransformers, the primary and secondary share?

- A. AC voltages
- B. DC
- C. A common winding
- D. Expanding magnetic field
- E. Secondary voltage
- F. None of the Above

245. The part of the winding connected to the source is the?

- A. Transformer
- B. Secondary coil
- C. Primary winding
- D. Secondary voltage
- E. Primary coil
- F. None of the Above

246. The part of the winding connected to the load is the _____.

- A. Secondary winding
- B. Secondary coil
- C. Primary winding
- D. Secondary voltage
- E. Primary coil
- 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
- B. Secondary coil
- C. Primary winding
- D. Winding
- E. Primary coil
- F. None of the Above

248. The location of the tap determines the number of turns in the?

- A. Transformer
- B. Secondary coil
- C. Primary winding
- D. Primary or secondary windings
- E. Primary coil
- 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
- B. The form of heat
- C. Second load
- D. The form of resistance
- E. A 120/240-volt system
- 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
- B. Voltage
- C. Current
- D. The form of 3-phase AC
- E. Three-phase electricity
- 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
- B. Voltage
- C. Current
- D. Ohms
- E. Three-phase electricity
- 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
- B. The form of heat
- C. Current
- D. The third wire
- E. A 120/240-volt system
- 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
- B. Voltage
- C. Current
- D. The form of 3-phase AC
- E. Three-phase electricity
- 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
- B. Voltage
- C. Current
- D. Ground
- E. Neutral
- F. None of the Above

257. Which of the following terms between the two hot wires is 240 volts?

- A. Second load
- B. Voltage
- C. Current
- D. Amps
- E. Ohms
- 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
- B. Voltage
- C. Current
- D. Resistance
- E. Hertz
- 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
- B. Voltage
- C. Current
- D. Resistance
- E. Three-phase electricity
- F. None of the Above

System Grounding

261. Most electrical supply systems, _____, are grounded at some point as a safety measure.

- A. Hot conductors
- B. Both AC and DC
- C. Load current
- D. An electrical conductor to the earth
- E. Grounding wire(s)
- 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
- B. GFI
- C. Safety devices
- D. Ground connection
- E. Zero voltage
- 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
- B. No resistance
- C. Load current
- D. An electrical conductor to the earth
- E. Grounding wire(s)
- 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
- B. An insulation fault
- C. Grounding Wire
- D. Ground connection
- E. Zero voltage
- 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
- B. 3-wire Edison system ground
- C. Grounding Wire fault
- D. Ground connection
- E. Zero voltage jumper
- 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
- B. 3-wire Edison system ground
- C. Grounding Wire fault
- D. Ground connection
- E. Zero voltage jumper
- F. None of the Above

268. The neutral in a 3-wire Edison system is a?

- A. Grounded conductor
- B. Fault
- C. Grounding Wire fault
- D. Ground connection
- E. Zero voltage jumper
- F. None of the Above

269. _____ developed in its connections, anything connected to ground by it would have voltage on it.

- A. Hot conductors
- B. No resistance
- C. Load current
- D. Resistance
- E. Grounding wire(s)
- 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
- B. Fault
- C. Grounding Wire fault
- D. Ground connection
- E. Zero voltage jumper
- 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 in to the earth. Neither a grounding a 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
- B. Grounded conductors
- C. Often uninsulated
- D. An electrical conductor to the earth
- E. Permanent
- 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
- B. 3-wire Edison system
- C. Grounding Wire
- D. Single-phase loads
- E. Single-phase transformer
- F. None of the Above

Four-Wire Wye

276. _____ can be connected between any powerline and the grounded neutral.

- A. Three-phase transformer
- B. 3-wire Edison system
- C. Grounding Wire
- D. Single-phase loads
- E. Single-phase transformer
- 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
- B. Terminals or leads
- C. Secondary winding
- D. Jumper
- E. Single-phase loads
- 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
- B. Terminals or leads
- C. Secondary winding
- D. Single-phase voltage
- E. Single-phase loads
- 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
- B. Loads
- C. The current
- D. Ampere(s)
- E. Resistance(s)
- 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
- B. Volts
- C. Current
- D. Ampere(s)
- E. Amperage
- 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.