

Name(s): _____ Team Number: _____
_____ Team Name: _____

Circuit Lab Test 2020 SSSS (Division B)

Each Team has 50 minutes to complete the test

Sections:

- Multiple Choice
- True Or False
- Matching
- Calculation
- Lab Portion

Score: _____/100

Multiple Choice

1. What instrument should be used to measure the resistance in a circuit? (1 point)
A. Ammeter B. Voltmeter C. Megohmmeter D. Ohmmeter
2. If a 120-volt incandescent lamp is used at 140-volts, what will be the result? (1 point)
A. Decreased lamp efficiency B. Shorter lamp life
C. A blown circuit fuse D. Less than normal light
3. What is the measuring unit of capacity? (1 point)
A. Farad B. Watt C. Ohm D. Coulomb
4. A wire has a resistance of 2 ohms per 1000 feet. A piece of this wire 750 feet long will have a resistance of _____ ohms. (1 point)
A. 2.5 B. 1.75 C. 1.5 D. 1.25
5. The current carrying capacity of a copper wire increases directly with its _____. (1 point)
A. Length B. Resistance C. Radius D. Cross-sectional area
6. A dielectric is defined as any non-conducting medium. Of the following, the one which should not be considered a dielectric is _____. (1 point)
A. Air B. Water C. Glass D. Rubber
7. Who invented the first electric battery in 1800? (1 point)
A. Kirchhoff B. Tesla C. Volta D. Faraday
8. A 10-watt and 100-watt incandescent lamp, both rated at 120 volts, are connected in series across a 120 volt-circuit. The amount of light given out by the 10-watt lamp will be _____. (1 point)
A. Practically none B. About normal
C. About half of normal D. Much greater than normal

9. The power taken by a 3000-watt 600-volt electric heater when connected to a 120-volt circuit is about _____ watts. (1 point)

- A. 5 B. 25 C. 120 D. 600

10. What is the function of an electrical voltage transformer? (1 point)

- A. Changes AC to DC B. Changes DC to AC
C. Changes AC voltage D. Changes DC voltage

11. A step-down voltage transformer has a turns ratio of 1:5. If the primary voltage is 440 volts AC, the secondary voltage is _____. (1 point)

- A. 5 volts B. 88 volts C. 440 volts D. 2200 volts

12. The rating term 1000-ohms, 5-watts would generally be applied to a _____. (1 point)

- A. Heater B. Resistor C. Condenser D. Motor

13. If a 110-volt transformer is accidentally connected to a 110-volt DC supply, then the most probable result would be _____. (1 point)

- A. Excessively high secondary voltage
B. Excessively high secondary current
C. Excessively high primary current
D. Below normal primary current

14. Who invented the first AC motor? (1 point)

- A. Edison B. Volta C. Coulomb D. Tesla

15. The least likely result of a severe electric shock is _____. (1 point)

- A. Unconsciousness B. Stoppage of breathing
C. A burn D. Bleeding

16. If a 5-ohm, a 10-ohm, and a 15-ohm resistor are connected in parallel across a 120-volt circuit, the voltage across the 15-ohm resistor will be _____. (1 point)

- A. 120 volts B. 60 volts C. 40 volts D. 20 volts

17. In the same circuit from question 16 what is the current passing through the 15-ohm resistor? (1 point)

- A. 4 Amps B. 8 Amps C. 16 Amps D. 20 Amps

18. If a 5-ohm, a 10-ohm, and a 15-ohm resistor are connected in series across a 120-volt circuit, the voltage across the 15-ohm resistor will be _____. (1 point)

- A. 60 volts B. 80 volts C. 100 volts D. 120 volts

19. In the same circuit from question 18 what is the current passing through the 15-ohm resistor? (1 point)

- A. 2 Amps B. 4 Amps C. 8 Amps D. 16 Amps

20. If four 10-ohm resistors are connected in parallel, the total circuit resistance will be _____. (1 point)

- A. 1.25 Ohms B. 2.5 Ohms C. 5 Ohms D. 10 Ohms

21. What type of electrical switch allows control of a light from two locations? (1 point)

- A. Double pole double throw switch
B. Single pole double throw switch
C. Three-way switch
D. Single pole single throw switch

22. What is the purpose of connecting batteries in parallel? (1 point)

- A. Increase voltage B. Increase period of usage
C. Decrease drop voltage D. Increase capacity

23. What is the purpose of connecting batteries in series? (1 point)

- A. Increase voltage B. Increase current
C. Increase capacity D. Increase period of usage

24. How to increase the capacitance of a capacitor? (1 point)

- A. Increase voltage
B. Increase plate cross-section
C. Increase distance between plates
D. Change the form of the plates

25. What is does voltage drop mean? (1 point)

- A. Short circuit
- B. Current decrease
- C. Resistance Increase
- D. Voltage loss

26. A step-up transformer is used to step-up _____. (1 point)

- A. Current
- B. Voltage
- C. Frequency
- D. Power

27. Four resistors, having respective current ratings of 1, 2, 3, and 4 amperes, are connected in series. If the resistors are not to be overloaded, the maximum current permissible in this circuit is _____. (1 point)

- A. 1 Ampere
- B. 2.5 Amperes
- C. 4 Amperes
- D. 10 Amperes

28. Five 24-volt lamps are connected in series is on a 120-volt line. If one lamp burns out, then a voltmeter connected across the socket of the burned out lamp will be read closest to _____. (1 point)

- A. 0 Volt
- B. 24 Volts
- C. 48 Volts
- D. 120 Volts

29. The metal frames of electrical units are grounded mainly to _____. (1 point)

- A. Eliminate short-circuits
- B. Save insulating material
- C. Protect against shock
- D. Prevent Overloading

30. An electrical device which can be used to convert DC to AC is a _____. (1 point)

- A. Inverter
- B. Transformer
- C. Transistor
- D. Rectifier

True or False

31. In an LED current always flows from the cathode to the anode. (1 point)

- A. True
- B. False

32. Electrical resistance of metal wire does not depend on the ambient temperature. (1 point)

- A. True
- B. False

33. Alternating current is more dangerous than direct current in the case of an electrical shock. (1 point)

A. True B. False

34. A rotating magnetic field can only be produced by AC. (1 point)

A. True B. False

35. A megohmmeter is used to measure conductance. (1 point)

A. True B. False

36. Electrical grounding provides a return path for a short circuit current. (1 point)

A. True B. False

37. Electrical impedance is related to AC circuits only. (1 point)

A. True B. False

38. Power Factor is related to DC circuits only. (1 point)

A. True B. False

39. LED stands for light emitting diode. (1 point)

A. True B. False

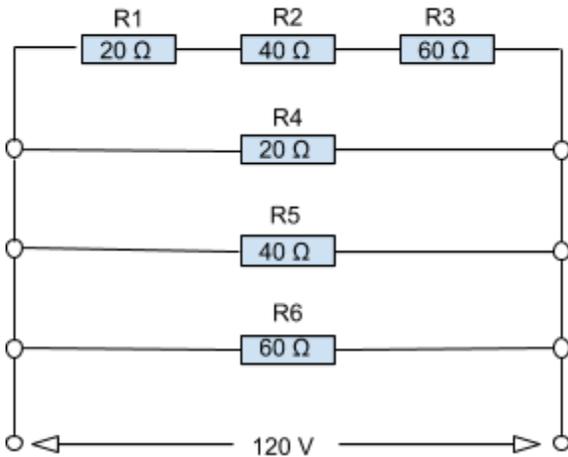
40. A rectifier is a device which converts DC to AC. (1 point)

A. True B. False

Matching: 1 point for each question

- | | |
|-------------|----------------------------------|
| 41. Tesla | A. Electromagnetic waves. |
| 42. Volta | B. First AC electrical motor. |
| 43. Ohm | C. Formula to calculate current. |
| 44. Hertz | D. First DC electrical motor. |
| 45. Faraday | E. Voltaic Pile. |

Calculation



46. Calculate the total (common) current in a 120-volt electrical circuit which consists of three resistors 20-ohms, 40-ohms, 60-ohms respectively, connected together in a series branch, and the same valued three other resistors connected in parallel as three separate branches across a 120-volt terminals. (5 points)

Answer: _____ Amperes

47. Calculate the total (equivalent) resistance of the circuit described in question 46. (5 points)

Answer: _____ Ohms

48. Calculate the voltage drop on every resistor 20-ohms, 40-ohms, and 60-ohms in the series branch of the circuit described in question 46. (5 points)

Answer: _____ Volts , _____ Volts , _____ Volts

49. Calculate the total electrical power consumed by all six resistors in the network from the circuit described in question 46. (5 points)

Answer: _____ Watts

50. Which is the separate branch that should be disconnected to reduce the total current by 2-amperes lower than in the original circuit described above? (5 points)

Answer: The _____ Ohm parallel branch.

Lab Portion

51. The following test is a simple way to prove practically Ohm's and Kirckoff's laws. You will be using the following components and devices: a breadboard, two AA batteries, a multimeter, six LEDs, and wires. The test requires you to assemble two different circuits with six LEDs following the steps below:

1. Assemble the first circuit consisting of three branches where two LEDs are connected in series in each branch.
2. Measure and write down the values of common and branch currents in the circuit.
3. Disassemble the first circuit and reuse its components to assemble the second circuit consisting of six parallel branches with one LED in each branch.
4. Repeat step 2 for the second circuit.
5. Compare and analyze results. Make a conclusion with references to Ohm's and Kirckoff's current laws. (30 points)

Answer:
