Name: _____ **Class:** _____ **Date:** _____ **ID: A**

Conceptual Physics Electricity and Circuits Practice Exam 2011

Multiple Choice
Identify the choice that best completes the statement or answers the question.

____ 1. In order to form an electric circuit, you need to have
a. wires or conductors to connect everything.
b. a power source.
c. a light bulb or some resistance.
d. a complete path for the current.
e. all of the above

____ 2. In order for current to flow in a circuit, you must have
a. a switch that is open.
b. a complete path for the current.
c. two light bulbs in parallel.
d. two light bulbs in series.
e. all of the above

____ 3. Electrical resistance is measured in
a. volts.
b. amperes.
c. joules.
d. watts.
e. none of the above.

____ 4. A closed circuit is a circuit in which charge
a. can flow.
b. is prevented from flowing.

____ 5. When two light bulbs are connected in series, the
a. current through each light bulb is proportional to the resistance of the bulb.
b. same amount of current always flows through each bulb.
c. neither A nor B

____ 6. The symbol used to represent resistance in a schematic diagram is
a. two straight lines.
b. a single line that is broken and has a bend in it.
c. one straight line.
d. a zigzag line.
e. none of the above

____ 7. When resistors are put in parallel with each other their overall resistance is
a. smaller than the resistance of any of the resistors.
b. larger than the resistance of any other resistor.
c. the same as the resistance of one of the resistors.

____ 8. As more lamps are put into a series circuit, the overall current in the circuit
   a. stays the same.
   b. increases.
   c. decreases.

____ 9. As more lamps are put into a parallel circuit, the overall current in the circuit
   a. increases.
   b. stays the same.
   c. decreases.

____ 10. When one light bulb in a parallel circuit containing several light bulbs burns out, the other light bulbs
   a. do not burn at all.
   b. burn brighter.
   c. burn the same as before.

____ 11. Electrical devices in our homes are connected in
   a. parallel.
   b. series.

____ 12. Fuses and circuit breakers are used to
   a. protect us.
   b. prevent overloading.
   c. keep wires from getting overheated.
   d. break the circuit when too much current is being used.
   e. all of the above

____ 13. The total resistance of a 10-ohm resistor and a 7-ohm resistor in series is
   a. 2 ohms.
   b. 3 ohms.
   c. 7 ohms.
   d. 17 ohms.
   e. 70 ohms.

____ 14. The total resistance of a 6-ohm resistor and a 12-ohm resistor in parallel is
   a. 4 ohms.
   b. 6 ohms.
   c. 18 ohms.
   d. 20 ohms.
   e. 73 ohms.

____ 15. Two electric devices are connected in series. The total resistance to current in the circuit is
   a. zero.
   b. the sum of the individual resistances along the circuit path.
   c. the difference between the individual resistances along the circuit path.
   d. the product of the individual resistances along the circuit path.

____ 16. In solid conductors, electric current is the flow of
a. positive and negative charges.
b. electrons.
c. negative ions.
d. protons.
e. none of the above

____ 17. An ampere is a
a. unit of resistance.
b. unit of current.
c. type of charge.
d. voltage.
e. current.

____ 18. An example of a voltage source is
a. a dry cell.
b. a generator.
c. a car battery.
d. rubbing a rubber rod with fur.
e. all of the above

____ 19. Electrical resistance in a wire depends on the wire's
a. thickness.
b. conductivity.
c. length.
d. all of the above
e. none of the above

____ 20. Compared to thin wires, electrical resistance in thick wires is
a. less.
b. the same.
c. greater.

____ 21. Electrical resistance is measured in
a. volts.
b. joules.
c. watts.
d. amperes.
e. none of the above

____ 22. While you are standing on the ground in your running shoes, the greatest resistance between you and the ground is in
a. your muscles.
b. your legs.
c. the clothes you are wearing.
d. your skin.
e. the running shoes.

____ 23. The primary reason a bird can perch harmlessly on bare high voltage wires is that
a. a bird's feet are close together.
b. a bird has a very large electrical resistance.
c. there is no potential difference across the bird's feet.
d. all of the above

____ 24. If you plug an electric toaster rated at 110 V into a 220-V outlet, current in the toaster will be
a. twice what it should be.
b. the same as if it were plugged into 110 V.
c. half what it should be.
d. more than twice what it should be.
e. none of the above

____ 25. The resistance of your dry skin is usually around
a. 0.001 ohm.
b. 1 ohm.
c. 100 ohms.
d. 100,000 ohms.
e. millions of ohms.

____ 26. Electric power is defined as
a. current times voltage.
b. current divided by voltage.
c. current times resistance.
d. resistance times voltage.
e. voltage divided by current.

____ 27. Compared to the filament thickness on a 60-W light bulb, the filament thickness of a 100-W light bulb will be
a. less.
b. the same.
c. greater.

____ 28. The current through a 5-ohm resistor connected to a 150-V power supply is
a. 1A.
b. 10 A.
c. 30 A.
d. 150 A.
e. none of the above

____ 29. What is the resistance of a toaster that uses 5 A of current when connected to a 120-volt power source?
a. 5 ohms
b. 24 ohms
c. 120 ohms
d. 600 ohms
e. none of the above

____ 30. If you accidentally grabbed the prongs of a partially plugged-in 120-V electrical plug on a day when your skin resistance was 130,000 ohms, how much current would pass through your body?
a. 0.0009 A
b. 120 A
c. 1,083 A
d. 130,000 A
e. 15,600,000 A

____ 31. How much power is used by a 12.0-V car battery that draws 0.5 A of current?
a. 0.5 W
b. 6 W
c. 12 W
d. 24 W
e. 30 W

____ 32. When plugged into a 120-V wall outlet, how much current is used by an electric blanket rated at 140 W?
a. 16,800 A
b. 140 A
c. 120 A
d. 1.2 A
e. none of the above

____ 33. A 120-watt light bulb is connected to a 120-V outlet. How much current is in the light bulb?
a. 0.5 A
b. 1 A
c. 2 A
d. 6 A
e. more than 6 A

____ 34. A light bulb is plugged into a 120-volt outlet and has a 0.7 A current in it. What is the power rating of the light bulb?
a. 12 W
b. 17 W
c. 84 W
d. 120 W
e. 171 W

____ 35. A 60-W light bulb and a 100-W light bulb are both rated at 120 V. Which light bulb has the larger resistance?
a. the 60-W bulb
b. the 100-W bulb
c. Both have the same resistance.

____ 36. A 60-W light bulb and a 100-W light bulb are each connected to a 120-V outlet. Which light bulb has more current in it?
a. the 60-W bulb.
b. the 100-W bulb.
c. The same amount of current flows in both.

____ 37. An electric heater is rated at 300 W for use in a 110-V circuit. The circuit breaker in the circuit can handle 12 A of current. How many heaters can be safely operated in the circuit?
a. 2
b. 3
c. 4
d. 5
e. more than 5

Essay

38. What is a series circuit? How do voltages, currents, and resistances add in a series circuit? Give an example.

39. What is overloading? What is a short circuit? How do fuses work, and how do they protect us from overloading or short-circuiting a circuit?

40. Suppose energy costs $0.09 per kilowatt-hour. How much would it cost to keep a 40-watt porch light on all night every night for one month? (The average month is 30 days, and the average night is 10 hours.)

Problem

41. What is the equivalent resistance of a 30-ohm and a 20-ohm resistor connected in parallel?

42. A 50.0-V battery is connected across a 10.0-ohm resistor and produces a current of 4.5 A. What is the internal resistance of the battery?

43. How much voltage is required to make 4 amperes flow through a 12-ohm resistor?

44. A battery does 18 J of work on 10 coulombs of charge. What voltage does the battery supply?

45. What is the current in a 60-W bulb connected to a 120-V source?

Conceptual Physics Electricity and Circuits Practice Exam 2011
Answer Section

MULTIPLE CHOICE

1. ANS: E PTS: 1 DIF: L1 OBJ: 35.1 A Battery and a Bulb
   STA: Ph.5.a KEY: circuit | path BLM: knowledge
2. ANS: B PTS: 1 DIF: L1 OBJ: 35.1 A Battery and a Bulb
   STA: Ph.5.a KEY: current | flow BLM: knowledge
3. ANS: E PTS: 1 DIF: L1
   OBJ: 35.6 Combining Resistors in a Compound Circuit STA: Ph.5.a | Ph.5.c
   KEY: resistance | unit BLM: knowledge
4. ANS: A PTS: 1 DIF: L1 OBJ: 35.2 Electric Circuits
   STA: Ph.5.a KEY: closed | circuit BLM: knowledge
5. ANS: B PTS: 1 DIF: L2 OBJ: 35.3 Series Circuits
   STA: Ph.5.a KEY: bulb | series BLM: comprehension
6. ANS: D PTS: 1 DIF: L1 OBJ: 35.5 Schematic Diagrams
   STA: Ph.5.a KEY: resistance | symbol BLM: knowledge
7. ANS: A PTS: 1 DIF: L2 OBJ: 35.4 Parallel Circuits
   STA: Ph.5.a KEY: resistor | parallel BLM: comprehension
8. ANS: C PTS: 1 DIF: L2 OBJ: 35.3 Series Circuits
   STA: Ph.5.a KEY: lamp | circuit | series BLM: comprehension
9. ANS: A PTS: 1 DIF: L2 OBJ: 35.4 Parallel Circuits
   STA: Ph.5.a KEY: parallel | circuit | lamp BLM: comprehension
10. ANS: C PTS: 1 DIF: L2 OBJ: 35.4 Parallel Circuits
    STA: Ph.5.a KEY: parallel | bulb | circuit BLM: application
11. ANS: A PTS: 1 DIF: L1
    OBJ: 35.7 Parallel Circuits and Overloading STA: Ph.5.a | Ph.5.c
    KEY: home | electricity BLM: knowledge
12. ANS: E PTS: 1 DIF: L1
    OBJ: 35.7 Parallel Circuits and Overloading STA: Ph.5.a | Ph.5.c
    KEY: fuse | breaker BLM: knowledge
13. ANS: D PTS: 1 DIF: L2
    OBJ: 35.6 Combining Resistors in a Compound Circuit STA: Ph.5.a | Ph.5.c
    KEY: resistor | series BLM: application
14. ANS: A PTS: 1 DIF: L2
    OBJ: 35.6 Combining Resistors in a Compound Circuit STA: Ph.5.a | Ph.5.c
    KEY: resistor | parallel BLM: application
15. ANS: B PTS: 1 DIF: L2 OBJ: 35.5 Schematic Diagrams
    STA: Ph.5.a KEY: schematic diagram | circuit BLM: application
16. ANS: B PTS: 1 DIF: L1 OBJ: 34.2 Electric Current
    STA: Ph.5.a | Ph.5.e KEY: conductor | solid | electrons
    BLM: knowledge
17. ANS: B PTS: 1 DIF: L1 OBJ: 34.2 Electric Current
    STA: Ph.5.a | Ph.5.e KEY: ampere | unit
    BLM: knowledge

18. ANS: E PTS: 1 DIF: L2 OBJ: 34.3 Voltage Sources
STA: Ph.5.c KEY: voltage BLM: comprehension
19. ANS: D PTS: 1 DIF: L2 OBJ: 34.4 Electric Resistance
STA: Ph.5.c KEY: resistance | length BLM: comprehension
20. ANS: A PTS: 1 DIF: L2 OBJ: 34.4 Electric Resistance
STA: Ph.5.c KEY: wire | thick | thin BLM: comprehension
21. ANS: E PTS: 1 DIF: L1 OBJ: 34.4 Electric Resistance
STA: Ph.5.c KEY: resistance | unit BLM: knowledge
22. ANS: E PTS: 1 DIF: L2 OBJ: 34.4 Electric Resistance
STA: Ph.5.c KEY: resistance | ground BLM: comprehension
23. ANS: C PTS: 1 DIF: L2 OBJ: 34.6 Ohm's Law and Electric Shock
STA: Ph.5.m KEY: potential | bird | wire BLM: comprehension
24. ANS: A PTS: 1 DIF: L2 OBJ: 34.5 Ohm's Law
STA: Ph.5.b KEY: current | voltage BLM: application
25. ANS: D PTS: 1 DIF: L1 OBJ: 34.6 Ohm's Law and Electric Shock
STA: Ph.5.m KEY: resistance | skin | ohm BLM: knowledge
26. ANS: A PTS: 1 DIF: L1 OBJ: 34.11 Electric Power
STA: Ph.5.a | Ph.5.b | Ph.5.c KEY: power | current | voltage
BLM: knowledge
27. ANS: C PTS: 1 DIF: L2 OBJ: 34.4 Electric Resistance
STA: Ph.5.c KEY: filament | bulb BLM: comprehension
28. ANS: C PTS: 1 DIF: L2 OBJ: 34.5 Ohm's Law
STA: Ph.5.b KEY: resistor | power BLM: application
29. ANS: B PTS: 1 DIF: L2 OBJ: 34.5 Ohm's Law
STA: Ph.5.b KEY: resistance | amp | volt BLM: application
30. ANS: A PTS: 1 DIF: L2
OBJ: 34.5 Ohm's Law | 34.6 Ohm's Law and Electric Shock STA: Ph.5.b | Ph.5.m
KEY: plug | resistance | current BLM: application
31. ANS: B PTS: 1 DIF: L2 OBJ: 34.11 Electric Power
STA: Ph.5.a | Ph.5.b | Ph.5.c KEY: outlet | current
BLM: application
32. ANS: D PTS: 1 DIF: L2 OBJ: 34.11 Electric Power
STA: Ph.5.a | Ph.5.b | Ph.5.c KEY: bulb | outlet BLM: application
33. ANS: B PTS: 1 DIF: L2 OBJ: 34.11 Electric Power
STA: Ph.5.a | Ph.5.b | Ph.5.c KEY: bulb | outlet BLM: application
34. ANS: C PTS: 1 DIF: L2 OBJ: 34.11 Electric Power
STA: Ph.5.a | Ph.5.b | Ph.5.c KEY: bulb | volt | power
BLM: application
35. ANS: A PTS: 1 DIF: L2 OBJ: 34.11 Electric Power
STA: Ph.5.a | Ph.5.b | Ph.5.c KEY: bulb | resistance
BLM: application
36. ANS: B PTS: 1 DIF: L2 OBJ: 34.11 Electric Power
STA: Ph.5.a | Ph.5.b | Ph.5.c KEY: outlet | current
BLM: application

37. ANS: C PTS: 1 DIF: L2 OBJ: 34.11 Electric Power
STA: Ph.5.a | Ph.5.b | Ph.5.c KEY: circuit breaker | current
BLM: application

ESSAY

38. ANS:
In a series circuit, electrical devices are connected one to another in a line. Voltages and resistances add when connected in series, and current is everywhere the same. Some sets of holiday lights are connected in series—when one light fails, all go out (because the circuit has been broken).

PTS: 1 DIF: L2 OBJ: 35.3 Series Circuits
STA: Ph.5.a KEY: series | current | resistance BLM: comprehension

39. ANS:
Overloading occurs when too many electrical devices are connected on one circuit. If the devices are connected in parallel, current in the circuit may get quite large. If it gets so large as to heat up the circuit wires, a fuse will melt and break the circuit (or a bimetallic strip may bend and activate a circuit breaker). Fuses are put in circuits to protect wires from overheating. A short circuit occurs when a positive wire touches a negative or ground wire. (The circuit actually becomes shorter in length.) The low resistance of the short circuit results in dangerously high current.

PTS: 1 DIF: L2 OBJ: 35.7 Parallel Circuits and Overloading
STA: Ph.5.a | Ph.5.c KEY: overload | circuit
BLM: comprehension

40. ANS:
30 days $\times$ 10 hours/day = 300 hours in a month. The light would cost
0.040 kW $\times$ 300 hr $\times$ \$0.09 / kw·hr = \$1.08

PTS: 1 DIF: L2 OBJ: 34.11 Electric Power
STA: Ph.5.a | Ph.5.b | Ph.5.c KEY: cost | energy BLM: application

PROBLEM

41. ANS:
12 ohms

PTS: 1 DIF: L2 OBJ: 35.6 Combining Resistors in a Compound Circuit
STA: Ph.5.a | Ph.5.c KEY: resistance | parallel
BLM: application

42. ANS:
1.1 ohms

PTS: 1 DIF: L2 OBJ: 35.6 Combining Resistors in a Compound Circuit
STA: Ph.5.a | Ph.5.c KEY: battery | resistance
BLM: application

43. ANS:
48 V

PTS: 1 DIF: L2 OBJ: 34.5 Ohm's Law
STA: Ph.5.b KEY: resistor | volt | amp BLM: application

44. ANS:
1.8 V

PTS: 1 DIF: L2 OBJ: 34.3 Voltage Sources
STA: Ph.5.c KEY: battery | coulomb BLM: application

45. ANS:
0.5 A

PTS: 1 DIF: L2 OBJ: 34.11 Electric Power
STA: Ph.5.a | Ph.5.b | Ph.5.c KEY: current | power
BLM: application