Quiz – Chapter 1 – Background Physics

1. The number of protons in the nucleus of an atom always
(a) equals its atomic number.
(b) equals its atomic weight.
(c) equals the number of electrons.
(d) equals the number of neutrons plus the number of electrons.

2. The number of neutrons in the nucleus of an atom sometimes
(a) equals its atomic number.
(b) equals its atomic weight.
(c) equals the number of protons.
(d) More than one of the above

3. The atomic weight of an atom always
(a) equals the number of electrons.
(b) equals the number of protons.
(c) equals the number of neutrons.
(d) approximately equals the number of neutrons plus the number of protons.

4. When an atom has a net negative electric charge, we can call it
(a) an anion.
(b) a cation.
(c) diatomic.
(d) positronic.

5. An atom can have
(a) more than one isotope.
(b) only one isotope.
(c) no more protons than neutrons.
(d) no more neutrons than protons.

6. An element whose atoms can have more than one atomic weight
(a) cannot exist.
(b) always has an electric charge.
(c) shares protons with surrounding atoms.
(d) is a common occurrence in nature.

7. A compound comprising three atoms
(a) cannot exist.
(b) always has an electric charge.
(c) shares protons with surrounding atoms.
(d) is a common occurrence in nature.

8. Ionization by itself never causes
(a) the conductivity of a substance to improve.
(b) an atom to gain or lose protons.
(c) an electrically neutral atom to become charged.
(d) an atom to gain or lose electrons.

9. Which of the following substances is the worst electrical conductor?
(a) Mercury
(b) Aluminum
(c) Glass
(d) Silver

10. Which of the following substances allows electrons to move among its atoms with the greatest ease?
(a) Copper
(b) Pure water
(c) Dry air
(d) Porcelain

11. If we place 12 V across a component whose resistance equals 6 ohms, how much current will flow through the component?
(a) 0.5 A
(b) 2 A
(c) 72 A
(d) We need more information to say.

12. If we double the resistance in the situation of Question 11 but don't change the voltage, the current will
(a) not change.
(b) get cut in half.
(c) double.
(d) quadruple.

13. The term static electricity refers to
(a) voltage with no current.
(b) current with no voltage.
(c) current through an infinite resistance.
(d) voltage that never changes.

14. Which of the following general statements applies to dielectric materials?
(a) They have extremely low resistance (practically zero).
(b) They have extremely high resistance (practically infinite).
(c) They have resistance that depends on the current through them.
(d) They produce two different voltages at the same time.

15. We can express the quantity of electrons flowing past a fixed point per unit of time in
(a) coulombs.
(b) volts.
(c) ohms.
(d) amperes.

16. In a lightning stroke, the term channel means
(a) a current-carrying path of ionized air.
(b) alternating-current frequency.
(c) a stream of moving protons and neutrons.
(d) a flowing stream of cool gas.

17. The term electromotive force (EMF) is an alternative expression for
(a) current.
(b) charge.
(c) voltage.
(d) resistance.

18. When you shuffle across a carpeted floor on a dry winter afternoon, you can acquire a potential difference, with respect to ground, of
(a) an ohm or two.
(b) up to about 200 ohms.
(c) millions of ohms.
(d) None of the above

19. Which of the following devices directly converts chemical energy to electricity?
(a) A generator
(b) A dry cll
(c) A motor
(d) A photovoltaic cell

20. Which of the following devices directly converts visible light to electricity?
(a) A generator
(b) A dry cell
(c) A motor
(d) A photovoltaic cell

Answers: 1. a, 2. d, 3. d, 4. a, 5. a, 6. d, 7. d, 8. b, 9. c, 10. a, 11. b, 12. b, 13. a, 14. b, 15. d, 16. a, 17. c, 18. d, 19. b, 20. d

Quiz – Chapter 2 – Electrical Units

1. In an electric dipole of constant polarity, the positive charge center
(a) has more electrons than the negative charge center.
(b) has the same number of electrons as the negative charge center.
(c) has fewer electrons than the negative charge center.
(d) sometimes has more electrons than the negative charge center, sometimes has the same number, and sometimes has fewer.

2. If you touch two points that have DC voltage between them, one point with your left hand and the other point with your right hand, which of the following voltages would present the greatest electrocution hazard?
(a) 1.5 V
(b) 15 V
(c) 150 V
(d) All three voltages would present equal electrocution hazards because it's the current that kills, not the voltage.

3. If you increase the DC voltage across a resistor by a factor of 100 but you also increase the resistance to keep the current constant, then (assuming the resistor doesn't burn out) the resistor will dissipate
(a) 100 times as much power as it did before.
(b) 10 times as much power as it did before.

(c) the same amount of power as it did before.
(d) 1/10 as much power as it did before.

4. If a length of wire exhibits 500 mS of conductance, then it has a resistance of
(a) 0.02 Ω.
(b) 0.2 Ω.
(c) 2 Ω.
(d) an amount that depends on how much current the wire carries.

5. A 330-Ω resistor has a conductance of
(a) 0.303 mS.
(b) 3.03 mS.
(c) 30.3 mS.
(d) 303 mS.

6. A circuit breaker is rated for 15.0 A in a 13.8-V DC automotive system (with the alternator running). This breaker should cut off the current if you connect a set of devices that demand a total of more than

(a) 207 W.
(b) 20.7 W.
(c) 1.09 W.
(d) 920 mW.

7. A heater warms a space by 1,000,000 J over a period of time. This amount of energy represents
(a) 1055 Btu.
(b) 948 Btu.
(c) 10.55 Btu.
(d) None of the above. The British thermal unit quantifies power, not energy!

8. Suppose that a 6.00-V battery delivers 4.00 W of power to a light bulb. How much current flows through the bulb?
(a) 24.0 A
(b) 1.50 A
(c) 667 mA
(d) We must know the bulb's resistance to calculate the current.

9. Imagine that a span of wire 200 m long has a conductance of 900 mS. A 600-m length of this wire would have a conductance of
(a) 8.10 S.
(b) 2.70 S.
(c) 300 mS.
(d) 100 mS.

10. Which of the following units quantifies energy?

(a) The erg
(b) The kilowatt-hour
(c) The joule
(d) All of the above

11. Suppose that an AC cycle repeats at a constant rate of one full cycle every 0.02 second. This wave has a frequency of
(a) 500 Hz.
(b) 200 Hz.
(c) 50 Hz.
(d) 20 Hz.

12. In many countries outside the United States, utility AC electricity has a frequency of
(a) 33 Hz.
(b) 50 Hz.
(c) 75 Hz.
(d) 100 Hz.

13. If we could see them, the magnetic flux contours near a straight, current-carrying wire would look like
(a) concentric circles with the wire at their centers.
(b) straight lines parallel to the wire.
(c) straight lines that all pass through the wire at right angles.
(d) spirals that originate on the wire and all lie in planes perpendicular to the wire.

14. A high DC voltage across a load (a component with DC resistance)
(a) gives rise to poor conductance.
(b) can exist even if the load has low resistance.
(c) invariably drives a lot of current through the load.
(d) All of the above

15. Suppose that DC flows through a wire coil. The magnetomotive force produced by this coil depends on
(a) the number of turns in the coil.
(b) the diameter of the coil.
(c) the resistance of the coil.
(d) the material around which the coil is wound.

16. Suppose that 3 A of current flows through a 100-turn, circular loop of wire wound around a powdered-iron rod. Then we remove the rod, leaving the coil with an air core. The magnetomotive force
(a) decreases.
(b) increases.
(c) stays the same.
(d) drops to zero.

17. Which, if any, of the following units can express magnetomotive force?

(a) The ampere-turn per square meter
(b) The weber per square meter
(c) The maxwell per square meter
(d) None of the above

18. Given a sine-wave AC input, the output of a full-wave rectifier
(a) has an average voltage equal to the peak voltage.
(b) comprises constant DC just like a battery produces.
(c) is pulsating DC.
(d) is also a sine wave.

19. Given a sine-wave AC input, the output of a half-wave rectifier
(a) has an average voltage equal to the peak voltage.
(b) comprises constant DC just like a battery produces.
(c) is pulsating DC.
(d) is also a sine wave.

20. Which of the following units can express overall magnetic-field quantity?
(a) The weber
(b) The coulomb
(c) The volt
(d) The watt

Answers:
1. c, 2. c, 3. a, 4. c, 5. b, 6. a, 7. b, 8. c, 9. c, 10. d, 11. c, 12. b, 13. a, 14. b, 15. a, 16. c, 17. d, 18. c, 19. c, 20. a

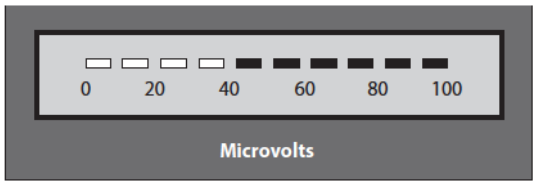
Quiz – Chapter 3 – Measuring Devices

1. You can use an oscilloscope to
(a) see the shape of an AC wave.
(b) detect an electrostatic charge.
(c) measure an extremely high resistance.
(d) measure electrical power.

2. An advantage of a meter that relies on electrostatic deflection rather than electromagnetic deflection is the fact that the electrostatic meter can measure
(a) the frequency of an AC wave.
(b) AC voltage as well as DC voltage.
(c) magnetic field strength as well as electric field strength.
(d) All of the above

3. An electronic thermometer works by measuring the DC output of
(a) a solar cell.
(b) an electroscope.
(c) an illuminometer.
(d) a thermocouple.

4. Which of the following voltages would produce the bar-graph-meter indication shown?



(a) 0.040 mV
(b) 0.40 mV
(c) 4.0 mV
(d) 40 mV

5. Which of the following statements about a DMM in comparison to analog VOM is correct?
(a) Small changes in the readings will be easier to visualize
(b) The cost of DMM is much higher than an analog meter
(c) The readings will be more accurate with a DMM
(d) All of the above

6. Which of the following phenomena can you use an oscilloscope to measure or observe?
(a) The waveform of an AC signal
(b) The frequency of an AC signal
(c) The peak-to-peak voltage of an AC signal

(d) Any of the above

7. An electric utility meter measures, on a monthly-use basis,
(a) energy.
(b) voltage.
(c) current.
(d) power.

8. You place a 12-V battery in series with a resistor and a galvanometer. The resulting current causes the compass needle to deflect 20 degrees toward the west. How can you get the needle to deflect 30 degrees toward the west?
(a) Maintain the battery polarity and decrease the resistance.
(b) Maintain the battery polarity and increase the resistance.
(c) Reverse the battery polarity and decrease the resistance.
(d) Reverse the battery polarity and increase the resistance.

9. Electrostatic force can directly cause
(a) two objects having opposite electric charges to repel.
(b) two objects having like electric charges to repel.
(c) electric current to stop flowing in a conductor if the voltage is too high.
(d) a compass needle to veer to the right or left, depending on the polarity.

10. Which of these features are you least likely to find on a DMM?
(a) Sound level measurement
(b) Temperature measurement
(c) Capacitance measurement
(d) Frequency measurement

11. You want to test a 330-Ω resistor to ensure that its actual resistance comes close to the specified value. You have an analog ohmmeter with a nonlinear scale that runs from "infinity" (at the far left) to 1 (at the far right) with 6 roughly in the middle (such as in Fig. 3-9), and that has range switches with six settings marked "x 1" to "x 100 k" in powers of 10. Which range switch will provide the most accurate reading? You can use Fig. 3-9 in the book as a visual aid.
(a) x 1
(b) x 100
(c) x 10 k
(d) x 100 k

12. An ideal ammeter would have
(a) infinite internal resistance.
(b) moderate internal resistance.
(c) low internal resistance.
(d) zero internal resistance.

13. Where would you place a DC voltmeter if you wanted to directly measure the voltage of a battery connected to an electrical circuit?
(a) Between either battery pole and electrical ground
(b) Between the negative battery pole and the circuit input
(c) Between the positive battery pole and the circuit input
(d) Between the negative battery pole and the positive battery pole

14. An ideal voltmeter would have
(a) infinite internal resistance.
(b) moderate internal resistance.
(c) low internal resistance.
(d) zero internal resistance.

15. Why should a voltmeter have a high internal resistance?
(a) To maximize the current that the meter draws from the circuit under test
(b) To minimize the risk of electric shock to technicians who use the meter
(c) To minimize the extent to which the meter disturbs the circuit under test
(d) To minimize the risk of the meter burning out

16. The measurement resistance of a DMM used in a voltage range will typically have a value of:
(a) Less than 10-Ω
(b) 100-k or more
(c) 1-M or more
(d) 10-M or more

17. In a general sense, bar-graph meters lack
(a) useful range.
(b) sensitivity.
(c) precision.
(d) physical ruggedness.

18. An analog ohmmeter has
(a) a nonlinear scale.
(b) a high current requirement.
(c) a bar-graph display.

(d) an AC power source.

19. You might find a D'Arsonval movement in an analog
(a) voltmeter.
(b) ammeter.
(c) ohmmeter.
(d) Any of the above

20. Which of the following statements are TRUE when considering Digital Oscilloscopes?
(a) Digital oscilloscopes only operate at low frequencies under 1MHz
(b) Digital oscilloscopes are more expensive than their CRT-based counterparts
(c) Some digital oscilloscopes can record readings for later analysis
(d) Digital oscilloscopes usually only have one channel

Answers:
1. a, 2. b, 3. d, 4. a, 5. c, 6. d, 7. a, 8. a, 9. b, 10. a, 11. b, 12. d, 13. d, 14. a, 15. c, 16. d, 17. c, 18. a, 19. d, 20. c

Quiz – Chapter 4 – Direct-Current Circuit Basics

1. We have an unlimited supply of 33-Ω resistors, each one capable of dissipating 0.50 W. We want a 33-Ω resistor that can dissipate 18 W (a figure that includes a 2-W safety margin). We can get that component by wiring up
(a) a 6 × 6 series-parallel matrix of individual resistors.
(b) a 9 × 4 series-parallel matrix of individual resistors.
(c) a 3 × 12 series-parallel matrix of individual resistors.
(d) Any of the above

2. We connect a 6.30-V lantern battery across a 330-Ω resistor. The resistor dissipates
(a) 19.0 mW of power.
(b) 8.31 mW of power.
(c) 120 mW of power.
(d) We need more information to calculate it.

3. If we connect 10 components in parallel, each one with a DC conductance of 0.15 S, what's the net DC conductance of the combination?
(a) 0.015 S
(b) 0.15 S
(c) 1.5 S
(d) 15 S

4. We have an unlimited supply of 100-Ω resistors, each one capable of dissipating 1.00 W. We want a resistance of 100 Ω capable of dissipating up to 12 W (a figure that includes a 2.5-W safety margin). Which of the following circuits is the smallest n × n matrix that will work here?
(a) A 5 × 5 matrix
(b) A 4 × 4 matrix
(c) A 3 × 3 matrix
(d) A 2 × 2 matrix

5. If we connect a 6.3-V battery across a 330-Ω resistor, the current is

(a) 72 mA.
(b) 36 mA.
(c) 12 mA.
(d) 19 mA.

6. The voltage across a resistor is 2.2 V. The resistor dissipates 400 mW. What's its resistance?
(a) 12 Ω
(b) 24 Ω
(c) 48 Ω
(d) 96 Ω

7. If we connect eight resistors in parallel, all identical and each with a value of 1.100 k, we get a component with a resistance of
(a) 8800 Ω.
(b) 4840 Ω.
(c) 1100 Ω.
(d) 137.5 Ω.

8. We wire up three resistors in parallel: 600 Ω, 300 Ω, and 200 Ω. Then we connect a 12-V battery across the combination. How much current does the 300-Ω resistor draw all by itself?
(a) 80 mA
(b) 40 mA
(c) 33 mA
(d) 11 mA

9. If we decrease the conductance of a resistor by a factor of 16 while leaving it connected to a source of constant DC voltage, then the power that the resistor dissipates will
(a) decrease by a factor of 16.
(b) decrease by a factor of 4.
(c) increase by a factor of 4.
(d) increase by a factor of 16.

10. If we double the DC voltage across a resistor and double its resistance as well, then the power that the resistor dissipates will
(a) get cut in half.
(b) stay the same.
(c) double.
(d) quadruple.

11. If we double the DC voltage across a resistor and double its resistance as well, then the current that the resistor draws will
(a) get cut in half.
(b) stay the same.
(c) double.
(d) quadruple.

12. If we know the current through a component (in amperes) and its resistance (in Ω), how can we calculate the energy (in joules) that the component consumes?
(a) Square the current and then multiply by the resistance.
(b) Multiply the current by the resistance.

(c) Divide the resistance by the current.
(d) We need more information to do it.

13. Suppose that 33.300 mA DC flows through a resistance of 3.333333 k. How can we best express the voltage across this resistance, taking significant figures into account?
(a) 111 V
(b) 111.0 V
(c) 111.00 V
(d) 110.999 V

14. If a potentiometer carries 18.5 mA DC and we set its resistance to 1.12 k, how much power does it dissipate?
(a) 383 mW
(b) 20.7 mW
(c) 60.5 mW
(d) 67.8 mW

15. We wire up seven 70.0-Ω resistors in parallel, and then connect a 12.6-V battery across the whole combination. How much current gets drawn from the battery?
(a) 25.7 mA
(b) 1.26 A
(c) 794 mA
(d) 180 mA

16. We remove three of the resistors from the circuit in Question 15. What will happen to the current drawn by any one of the remaining four resistors?
(a) It will go down to zero.
(b) It will become 4/7 of its previous value.
(c) It will stay the same.
(d) It will become 7/4 of its previous value.

17. We connect resistors with values of 180, 270, and 680 Ω in series with a 12.6-V battery. How much power does the set of resistors dissipate as a whole?
(a) 7.12 W
(b) 89.7 W
(c) 11.2 mW
(d) 140 mW

18. The three primary units that engineers use when working with DC systems are the
(a) ampere, volt, and ohm.
(b) watt, joule, and volt.
(c) siemens, ampere, and joule.
(d) erg, joule, and ohm.

19. A direct current of 3.00 A flows through a component whose conductance is 0.250 S. What's the voltage across the component?
(a) 0.750 V
(b) 12.0 V
(c) 36.0 V
(d) We need more information to calculate it.

20. A direct current of 3.00 A flows through a component whose conductance is 0.250 S. How

much power does the component dissipate?
(a) 750 mW
(b) 2.25 W
(c) 36.0 W
(d) We need more information to calculate it.

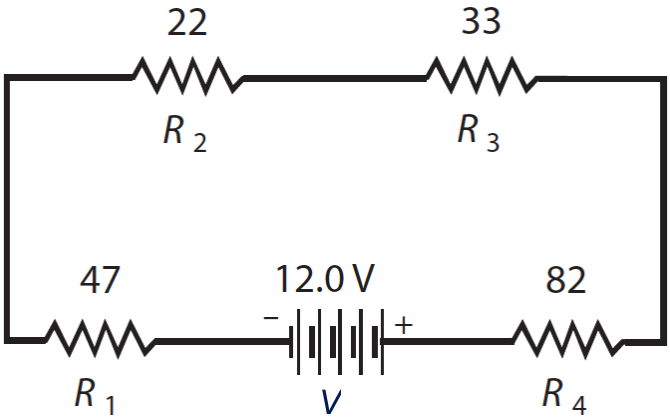
Answers:
1. a, 2. c, 3. c, 4. b, 5. d, 6. a, 7. d, 8. b, 9. a, 10. c, 11. b, 12. d, 13. c, 14. a, 15. b, 16. c, 17. d, 18. a, 19. b, 20. c

Quiz – Chapter 5 – Direct-Current Circuit Analysis

1. Consider a series-connected string of 10 light bulbs, all of which work properly, and all of which get their power from a single battery. Suddenly one of the bulbs burns out, leaving an open circuit in its place. What will happen?
(a) All the other bulbs will go out.
(b) The total current drawn from the battery will go up slightly.
(c) The total current drawn from the battery will go down slightly.
(d) The total current drawn from the battery will not change.

2. You connect four resistors in series with a 12.0-V battery: $R_1 = 47\ \Omega$, $R_2 = 22\ \Omega$, $R_3 = 33\ \Omega$, and $R_4 = 82\ \Omega$, as shown below. How much current flows through R_3?

Schematic 5-1



(a) 0.72 A
(b) 0.36 A
(c) 0.065 A
(d) 0.015 A

3. In the circuit 5-1, how much voltage appears across the series combination of resistances R_2 and R_3?
(a) 7.5 V
(b) 3.6 V
(c) 8.8 V
(d) 12 V

4. In the circuit 5-1, how much power does the series combination of resistances R2 and R3 dissipate?
(a) 3.6 W
(b) 1.8 W

(c) 0.46 W
(d) 0.23 W

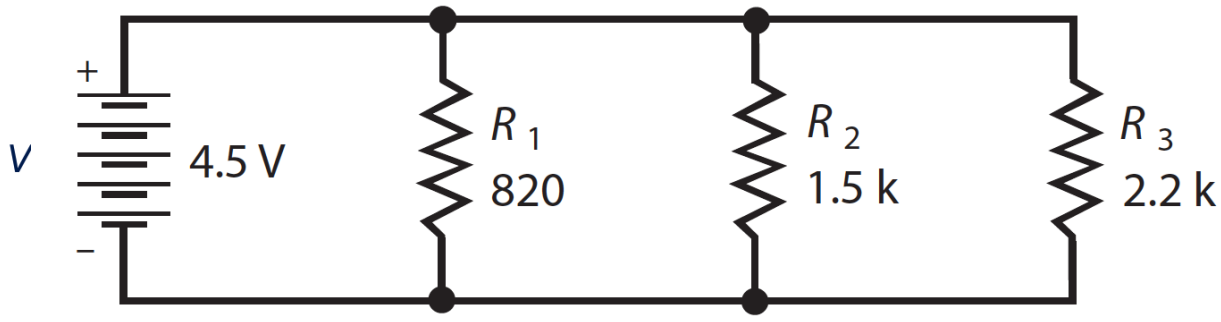
5. In the circuit of 5-1, how much power does R3 dissipate?
(a) 0.14 W
(b) 0.28 W
(c) 1.1 W
(d) 2.2 W

6. Fill in the blanks in the following sentence to make it true: "In a parallel DC circuit containing a battery and two or more resistors, the _____ any resistor is the same as the _____ any other resistor."
(a) potential difference across
(b) current flowing through
(c) power dissipated by
(d) conductance of

7. Look back at schematic 5-1. Suppose the battery supplies 12.0 V. We don't know any of the resistance values, but we do know that they're all the same. What's the voltage V2?
(a) 12.0 V
(b) 6.00 V
(c) 4.00 V
(d) 3.00 V.

8. Three resistors are connected in parallel across a 4.5-V battery: R1 = 820 Ω, R2 = 1.5 k, and R3 = 2.2 k, as shown in Fig. 5-10. How much voltage appears across R2?
(a) 3.0 mV
(b) 1.5 V
(c) 4.5 V
(d) We need more information to calculate it.

Schematic 5-2



9. In the circuit of 5-2, how much current flows through R2?
(a) 3.0 mA
(b) 14 mA
(c) 333 mA
(d) We need more information to calculate it.

10. In the circuit of 5-2, how much power does R2 draw from the battery?
(a) 14 mW

(b) 333 mW
(c) 9.0 μW
(d) We need more information to calculate it.

11. In the circuit of 5-2, how would we calculate the net conductance of the resistor network?
(a) Add the conductances of the resistors.
(b) Average the conductances of the resistors.
(c) Take the reciprocal of the sum of the conductances of the resistors.
(d) Take the reciprocal of the average of the conductances of the resistors.

12. In the circuit of 5-2, how much energy does the resistor network consume?
(a) 5.5 joules
(b) 9.2 joules
(c) 47 joules
(d) We need more information to figure it out.

13. In the circuit of 5-2, what will happen to the power dissipated by the network as a whole, if we change the value of R1 from 820 to 8.2 Ω, but leave all the other values alone?
(a) It will decrease a little.
(b) It will decrease a lot.
(c) It will increase a little.

(d) It will increase a lot.

14. Refer back to Fig. 5-5B in the book. Suppose that I3 + I4 + I5 = 250 mA. If I1 = 100 mA, what's the current I2 through the resistor to the lower right of point Z?
(a) 33 mA
(b) 50 mA
(c) 150 mA
(d) 300 mA

15. Refer to Fig. 5-7 in the book. Suppose that the circuit has 10 resistors in total (n = 10), they all have values of 100 Ω, and the battery provides 6.3 V. If we double all the resistances to 200 Ω, what will happen to the voltage at point P2?
(a) It will double.
(b) It will stay the same.
(c) It will get cut in half.
(d) We need more information to figure it out.

16. In the scenario of Fig. 5-7, suppose once more that n = 10; but instead of 100 Ω, the resistors all have values of 50 Ω. If we double the battery voltage to 12.6 V, in addition to changing the resistances, what will happen to the voltage at point P2?
(a) It will double.
(b) It will stay the same.
(c) It will get cut in half.
(d) We need more information to figure it out.

17. Imagine four 100-Ω resistors in series, connected to a battery that supplies a voltage such that the entire network dissipates 4.00 W. How much power does each resistor consume?

(a) 125 mW
(b) 250 mW
(c) 500 mW
(d) 1.00 W

18. Imagine four 100-Ω resistors in parallel, connected to a battery that supplies a voltage such that the entire network dissipates 4.00 W. How much power does each resistor consume?
(a) 125 mW
(b) 250 mW
(c) 500 mW
(d) 1.00 W

19. Imagine four 100-Ω resistors in a 2 × 2 series-parallel matrix, connected to a battery that supplies a voltage such that the entire network dissipates 4.00 W. How much power does each resistor consume?
(a) 125 mW
(b) 250 mW
(c) 500 mW
(d) 1.00 W

20. When you design and build a voltage divider network, you should make the resistors' ohmic values as small as possible without imposing too much current demand on the power supply in order to:
(a) minimize the effect of external components on the network's behavior.
(b) maximize the voltages at the various points in the network.
(c) minimize the voltages at the various points in the network.
(d) prevent overstressing external components connected to the network.

Answers:
1. a, 2. c, 3. b, 4. d, 5. a, 6. a, 7. d, 8. c, 9. a, 10. a, 11. a, 12. d, 13. d, 14. c, 15. b, 16. a, 17. d, 18. d, 19. d, 20. a

Quiz – Chapter 6 - Resistors

1. As a repair technician, if you want to keep high-voltage, power-supply filter capacitors from electrocuting you after you switch off the supply, but not let them interfere with the supply's performance when it's powered up, what should you do?
(a) Wait 10 minutes after powering-down before you begin work.
(b) Permanently short circuit all the filter capacitors.
(c) Install inductors in series with all the capacitors.
(d) None of the above

2. You have a package of resistors, all rated at 330 Ω ±10%. You test three of them with an ohmmeter, obtaining the readings in (a), (b), and (c) below. Which, if any, of these tested values lies outside the tolerance range, telling you that the component is a reject?
(a) 299 ohms
(b) 305 ohms
(c) 362 ohms
(d) They're all okay

3. Which of the following resistor types is a good choice for use in a circuit designed to operate at 14 MHz?

(a) Carbon-composition
(b) Carbon-film
(c) Metal-film
(d) Any of the above

4. What is the purpose of putting a resistor in series with an LED?
(a) Bleeding of charge
(b) Power dissipation.
(c) Current limiting.
(d) Volt6age division.

5. The working part of a “dummy” antenna is
(a) an inductor.
(b) a resistor.
(c) a capacitor.
(d) a short circuit.

6. In the schematic diagram for a transistorized amplifier, you see a resistor between the base and ground, and another resistor between the base and the positive battery terminal. What purpose do these resistors serve if you choose their values correctly?
(a) They maximize the current that flows through the transistor.
(b) They bleed off any excess charge that might exist on the base.
(c) They optimize the bias at the base.
(d) They keep the transistor from shorting out.

7. A resistor has three colored bands, going from left to right in this order: green, red, brown. As rated by the manufacturer, its resistance is close to
(a) 68 ohms.
(b) 520 ohms.
(c) 8.2 k.
(d) 18 k.

8. The most common way to limit the current through an LED is to connect a resistor between the
(a) in parallel with the LED.
(b) the positive supply voltage and ground
(c) in series with the LED.
(d) any of the above.

9. In which of the following situations should we expect a 200-W wirewound resistor to work well?
(a) In series with the emitter of a high-power RF amplifier transistor, for the purpose of current limiting
(b) In series with the collector of a low-power RF amplifier transistor, for the purpose of voltage limiting
(c) In series with the filter capacitor in a power supply, for the purpose of minimizing the output ripple
(d) In any DC circuit needing a resistor that can dissipate far more power than a carbonbased resistor can do

10. A 470-Ω resistor carries 15 mA continuously. What resistor power rating is sufficient, but not needlessly high?
(a) . W
(b) 1 W
(c) 2 W
(d) 5 W

11. How much voltage (rounded to two significant figures) appears across the resistor described

in Question 10?
(a) 0.15 V
(b) 7.1 V
(c) 10 V
(d) 70 V

12. You find a resistor with a manufacturer's rated value of 470 Ω. You measure its resistance as 490 Ω. What's the percentage difference between the measured value and the manufacturer's rated value?
(a) + 4.08%
(b) + 4.26%
(c) - 4.08%
(d) – 4.26%

13. In an audio-taper potentiometer, the resistance varies in proportion to the
(a) angular shaft displacement.
(b) logarithm of the angular shaft displacement.
(c) square of the angular shaft displacement.
(d) square root of the angular shaft displacement.

14. Refer to Fig. 6-4 in the book. You connect this circuit in a DC power supply designed to provide 800 V DC. If you properly choose the resistor's ohmic value, it can
(a) reduce the chance that a repair technician will get killed.
(b) prevent capacitor C from shorting out or opening up.
(c) maximize the efficiency of the power supply as a whole.
(d) eliminate the output ripple whether the capacitor works or not.

15. If a 100 Ω resistor is placed in series with an LED with a forward voltage of 3 V, and connected to a 9V battery, what current will flow through the LED?
(a) 60mA
(b) 90mA
(c) 120mA
(d) We do not have enough information to calulate this.

16. A resistor has the following colored bands: red, red, red, silver. What's its resistance as rated by the manufacturer?
(a) 22 ohms ± 10%
(b) 220 ohms ± 10%
(c) 2.2 k ± 10%
(d) 22 k ± 10%

17. A 'chip' SMD resistor is marked with the value 4704 what is its ohmic value?
(a) 474 Ω
(b) 470 Ω
(c) 470 k
(d) 4.7 M

18 . For the volume control in an audio amplifier, you would get the best results with a
(a) log-taper potentiometer.
(b) linear-taper potentiometer.
(c) wirewound resistor.
(d) metal-film resistor.

19 . If you want to build a graphic equalizer for your hi-fi system, you would probably want to use
(a) wire-wound resistors.
(b) voltage dividers.
(c) slide potentiometers.

(d) rotary potentiometers.

20 . Which of the following resistor types has minimal reactance?
(a) carbon-composition
(b) inductive
(c) wirewound
(d) capacitive

Answers:
1. d, 2. d, 3. d, 4. c, 5. b, 6. c, 7. b, 8. c, 9. d, 10. a, 11. b, 12. b, 13. b, 14. a, 15. a, 16. c, 17. d, 18. a, 19. c, 20. a

Quiz – Chapter 7 – Cells and Batteries

1. Some interactive solar power systems for residential homes
(a) operate from storage batteries during the day and recharge them at night.
(b) can operate sophisticated systems such as computers, but not simple appliances such as lamps.
(c) operate independently from the electric company.
(d) allow the homeowner to sell energy to the electric company when the solar panels produce more power than the home needs.

2. Fill in the blank to make this statement true: "If you plot a battery discharge graph and see steady current for a while and then a rapid drop, then your battery has a _____ discharge characteristic."
(a) uniform
(b) flat
(c) logarithmic
(d) linear

3. A rechargeable battery, such as the one that starts your car, comprises
(a) stand-alone cells.
(b) primary cells.
(c) secondary cells.
(d) interactive cells.

4. If all other factors remain constant, then the total energy that an electrochemical battery can produce depends on
(a) its voltage.
(b) the number of cells that it has.
(c) its size and mass.
(d) the brightness of the light striking it.

5. The no-load voltage produced by several identical cells connected in series is
(a) higher than the voltage produced by a single cell.
(b) the same as the voltage produced by a single cell.
(c) lower than the voltage produced by a single cell.
(d) dependent on the current.

6. Under no-load conditions and bright sunlight, the output voltage from a PV cell
(a) attains its maximum possible value.
(b) declines with time.
(c) increases with time.
(d) equals zero.

7. What does a power inverter not do?

(a) Allow household appliances to operate from batteries.
(b) Convert AC to DC.
(c) Convert DC to AC.
(d) Work in solar power systems for home use.

8. Fill in the blank to make the following statement true: “Memory drain sometimes occurs in _____ cells and batteries.”
(a) primary
(b) alkaline
(c) photovoltaic
(d) nickel-based

9. We connect five identical cells in parallel. Each individual cell produces 1.5 V under no-load conditions, and can deliver up to 12 A of current with a heavy load. Which of the following characteristics can we expect the whole battery to have?
(a) A no-load voltage of 1.5 V and a maximum deliverable current of 12 A
(b) A no-load voltage of 1.5 V and a maximum deliverable current of 60 A
(c) A no-load voltage of 7.5 V and a maximum deliverable current of 12 A
(d) A no-load voltage of 7.5 V and a maximum deliverable current of 60 A

10. Most automotive batteries contain, among other things,
(a) sulfuric acid.
(b) nickel.
(c) cadmium.
(d) P-type silicon.

11. You have a new 6.3-V battery with an energy storage capacity of 5.2 Ah. If you connect a 63-ohm resistor to the battery but no other load, for how long should you expect current to flow through the resistor?
(a) 31 minutes
(b) 5 hours and 12 minutes
(c) 2 days and 4 hours
(d) 21 days and 16 hours

12. The maximum current that a battery can deliver depends on
(a) its chemical composition.
(b) the number of cells that it has.
(c) its no-load output voltage.
(d) its no-load output power.

13. Which of these battery technologies has the best energy density (Wh / kg) - b
(a) Lead-acid
(b) LiPo
(c) NiMh
(d) Alkaline

14. The maximum power that a silicon PV panel can deliver depends on
(a) its surface area.
(b) the voltage of its cells.
(c) its no-load output voltage.
(d) its no-load output current.

15. Figure 7-3 represents a cell or battery with
(a) nonlinear voltage output.
(b) a nearly ideal discharge characteristic.
(c) poor energy-handling capability.
(d) nonlinear power storage capacity.

16. Fill in the blank to make the following sentence true: “A transistor battery has a voltage equal to that of _____ size AA ‘grocery store’ flashlight cells connected in series.”
(a) three
(b) four
(c) six
(d) nine

17. You have two identical alkaline cells that each produce exactly 1.5 V as long as the current demand remains under 2.0 A. You connect them in series and then place a 1.5 k resistor across the combination. The resistor draws
(a) 0.5 mA of current.
(b) 1.0 mA of current.
(c) 2.0 mA of current.
(d) 4.0 mA of current.

18. You connect the same two cells (those described in the previous question) in parallel and then place a 1.5 k resistor across the combination. The resistor draws a current of
(a) 0.5 mA.
(b) 1.0 mA.
(c) 2.0 mA.
(d) 4.0 mA.

19. You have two identical alkaline cells that each produce 1.5 V as long as the current demand remains under 2.0 A. You connect them in series and then place a 1.5 k resistor across the combination. The resistor dissipates
(a) 1.5 mW of power.
(b) 3.0 mW of power.
(c) 6.0 mW of power.
(d) 12 mW of power.

20. You connect the same two cells (those described in the previous three questions) in parallel and then place a 1.5 k resistor across the combination. The resistor dissipates
(a) 1.5 mW of power.
(b) 3.0 mW of power.
(c) 6.0 mW of power.
(d) 12 mW of power.

Answers:
1. d, 2. b, 3. c, 4. c, 5. a, 6. a, 7. b, 8. d, 9. b, 10. a, 11. c, 12. a, 13. b, 14. a, 15. b, 16. c, 17. c, 18. b, 19. c, 20. a

Quiz – Chapter 8 - Magnetism

1. If a solenoidal wire coil has 50 turns and carries 500 mA, then it gives rise to a magnetomotive force of
(a) 25 At.
(b) 50 At.
(c) 500 At.
(d) None of the above

2. The magnetic field produced by an electromagnet connected to a lantern battery
(a) fluctuates in intensity from instant to instant in time, and periodically reverses polarity.
(b) fluctuates in intensity from instant to instant in time, but maintains the same polarity at all times.
(c) maintains constant intensity but periodically reverses polarity.
(d) maintains constant intensity and the same polarity all the time.

3. A sample of ferromagnetic material
(a) cannot work as the core for an electromagnet.
(b) does not “attract” or “stick to” magnets.
(c) causes magnetic flux lines to bunch up more tightly than they do in free space.
(d) has a permeability of 0.

4. The magnetic flux contours near the ends of a bar magnet take the form of
(a) straight lines parallel to the bar’s axis.
(b) straight lines perpendicular to the bar’s axis.
(c) circles whose centers lie on the bar’s axis.
(d) curves that converge on (or diverge from) the bar’s ends.

5. If you want to build an electromagnet that will produce an alternating magnetic field when you connect it to a lantern battery, you should choose a core material that has
(a) high permeability and high retentivity.
(b) high permeability and low retentivity.
(c) low permeability and high retentivity.
(d) no known characteristics; you can’t build such an electromagnet.

6. A metal rod can support a flux density of up to 800 G when DC flows in a coil surrounding it. When you remove the rod leaving only air, the flux density in that air goes down to 20 G. What’s the permeability of the rod?
(a) You need more information to figure it out.
(b) 40
(c) 0.025
(d) 410

7. What’s the retentivity of the rod described in Question 6?
(a) You need more information to figure it out.
(b) 40
(c) 0.025
(d) 410

8. Which of the following units expresses magnetic flux density?
(a) Tesla
(b) Ampere
(c) Coulomb
(d) Siemens

9. What’s the magnetic flux density at a point 2.00 m away from a straight, thin wire carrying 600 mA of DC?
(a) 6.00 Å~ 10^{-7} T
(b) 6.00 Å~ 10^{-8} T
(c) 3.00 Å~ 10^{-7} T
(d) 3.00 Å~ 10^{-8} T

10. You wind 70 turns of heavy copper insulated wire in a coil around a rod-shaped ferromagnetic core. You drive 22 A of DC through the coil. Then you double the current to 44 A. If the core reaches a state of saturation and if 3.3 A or more flows through the coil, the current increase described here causes the flux density inside the core to essentially
(a) stay the same.
(b) increase by a factor of the square root of 2.
(c) double.
(d) quadruple.

11. A normally open relay completes an external circuit

(a) whether current flows in its coil or not.
(b) only when current flows in its coil.
(c) only when no current flows in its coil.
(d) only when AC flows in its coil.

12. At a specific point on the earth's surface, the term geomagnetic declination refers to
(a) the vertical tilt of the earth's magnetic flux lines.
(b) the horizontal deflection of the earth's magnetic field.
(c) the geomagnetic flux density through a horizontal plane.
(d) the angular difference between geomagnetic north and true north.

13. If you want to make a powerful permanent magnet, you'll need an alloy that has
(a) low permeability.
(b) high density.
(c) high retentivity.
(d) low resistance per unit of length.

14. When you place a current-carrying wire coil in a vacuum, the magnetic flux density inside that coil
(a) goes down to zero.
(b) increases compared with the flux density when it has a ferromagnetic core.
(c) decreases compared with the flux density when it has a ferromagnetic core.
(d) remains the same as the flux density when it has a ferromagnetic core.

15. At the geomagnetic equator, the geomagnetic field's force on a compass needle is
(a) horizontal.
(b) vertical.
(c) slanted.
(d) nonexistent.

16. If a solenoidal wire coil has 1000 turns and carries 30.00 mA of DC, then its magnetomotive force is
(a) dependent on the coil's length, diameter, and core material.
(b) 37.71 Gb.
(c) 1131 Gb.
(d) 6.885 Gb.

17. If a solenoidal coil has 60 turns and you connect it to a 6.3-V lantern battery, how much magnetomotive force does that coil produce?
(a) It depends on its diameter.
(b) It depends on its DC conductance.
(c) It depends on its core material.
(d) All of the above

18. If you insert a ferromagnetic rod of permeability 16.0 inside the coil described in Question 17, the magnetomotive force will
(a) increase by a factor of 4.00.
(b) increase by a factor of 16.0.
(c) increase by a factor of 256.
(d) not change.

19. The magnetic force between the ends of two electromagnets depends on
(a) the electromagnets' core material.
(b) the distance between those ends.
(c) the currents in the coils.
(d) All of the above

20. Geomagnetic storms often accompany
(a) “northern lights” (aurora borealis).
(b) sudden changes in the sun’s diameter.
(c) polarity reversals in the earth’s magnetic field.
(d) thundershowers in their immediate vicinity.

Answers:
1. a, 2. d, 3. c, 4. d, 5. d, 6. b, 7. a, 8. a, 9. b, 10. a, 11. b, 12. d, 13. c, 14. c, 15. a, 16. b, 17. b, 18. d, 19. d, 20. a

Test – Part 1.

Test your knowledge on the whole of the first section of the book here.

1. What can we call a solid medium with resistance so high that it’s infinite for practical purposes?
(a) A static medium
(b) A separator
(c) An insulator
(d) A dynamic medium
(e) A diamagnet

2. Which of the following characteristics represents a problem with analog meters that have a needle or pointer that moves continuously along a scale on the meter face?
(a) They require the user to work with a conversion chart to figure out the reading.
(b) They have poor sensitivity at low frequencies.
(c) They don’t display rapidly changing values.
(d) The user must sometimes “guesstimate” the readings between scale divisions.
(e) They can respond only to AC, not to DC.

3. We connect a 24-V battery at opposite ends of a set of six 4-Ω resistors in series. As a result, we see the same voltage across each individual resistor. If we replace the 4-Ω resistors with 8-Ω resistors, what will happen to the voltage across each resistor?
(a) It will go down to . of its previous value.
(b) It will go down to half its previous value.
(c) It will stay the same.
(d) It will double.
(e) It will quadruple.

4. In an electrical conductor, true direct current
(a) never varies in intensity.
(b) periodically reverses direction.
(c) periodically varies in intensity.
(d) never reverses direction.
(e) always comes from a battery.

5. In a set of resistors connected in series with a battery, the current through a particular resistor
(a) equals the current through any other resistor.
(b) equals the battery voltage divided by the resistance of the resistor.
(c) equals the voltage across the resistor.
(d) equals the battery current divided by the total number of resistors.
(e) equals the battery current minus the combined current through all the other resistors.

6. If you live near the equator, you can expect to see the aurora borealis (“northern lights”) at night
(a) during a geomagnetic storm.
(b) just before or after a tropical storm.
(c) when a volcanic eruption occurs nearby.

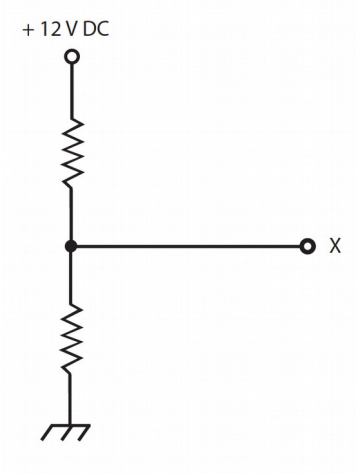
(d) during a lunar eclipse.
(e) rarely, if ever.

7. A DC ohmmeter will give us a correct reading for a component in isolation (not connected to anything else) if that component
(a) contains inductance and resistance in series.
(b) contains capacitance and resistance in parallel.
(c) contains pure resistance.
(d) contains pure inductance.
(e) Any of the above

8. In a DC circuit, the ratio of current to conductance in a length of wire expresses
(a) voltage.
(b) power.
(c) energy.
(d) resistance.
(e) permeability.

9. In a DC circuit, 1000 μA flows through a resistor that dissipates 200 mW. What is the voltage drop (potential difference) across this resistor?
(a) We need more information to calculate it.
(b) 200 mV
(c) 2 V
(d) 20 V
(e) 200 V

Schematic P1-1.



10. What purpose do the resistors serve in the arrangement shown by Schematic P1-1?
(a) They short-circuit the input, protecting the point X from excessive current.
(b) They bleed off excess electrical charge from point X.
(c) They keep the battery charged from a DC source connected to point X.
(d) They provide a specific DC voltage at point X between 0 V and + 12 V.
(e) They turn the DC from the voltage source into AC for use with a common household appliance.

11. Zinc-carbon flashlight cells
(a) can be discharged only once, and then you must discard them.
(b) have higher voltages than other types of cells.
(c) supply about 0.5 to 0.6 V DC.
(d) can be recharged hundreds of times if you take good care of them.

(e) contain liquid acid that can cause serious burns.

12. How long would a 50-W bulb have to remain continuously aglow to consume 6 kWh of energy?
(a) 50 minutes
(b) 1 hour and 12 minutes
(c) 5 days
(d) 12 days and 12 hours
(e) We need more information to answer this question.

13. Suppose that a 24-V battery causes 200 mA of current to flow through a light bulb. What's the resistance of the bulb under these conditions?
(a) 30 Ω
(b) 60 Ω
(c) 120 Ω
(d) 240 Ω
(e) We need more information to figure it out.

14. We can use a series combination of resistors to
(a) build a voltage divider.
(b) limit the current through a device.
(c) get an ohmic value that none of our individual resistors have.
(d) bleed off the charge from a capacitor.
(e) All of the above

15. A phenomenon that shortens a cell's discharge cycle so that you must recharge it more often than normal, can occur in
(a) alkaline cells.
(b) zinc-carbon cells.
(c) lead-acid cells.
(d) LiPo cells.
(e) None of the above

16. We connect a 6-V battery to a series combination of two 30-Ω resistors. How much power does either resistor dissipate all by itself?
(a) 150 mW
(b) 300 mW
(c) 1.2 W
(d) 4.8 W
(e) 9.6 W

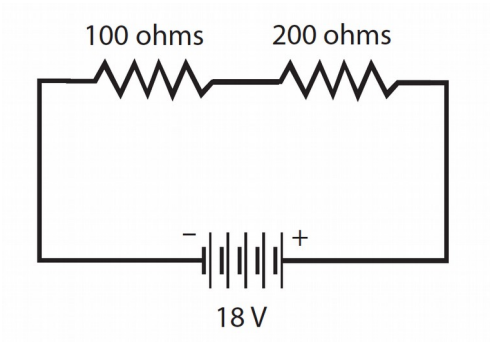
17. We connect a 6-V battery to a parallel combination of two 30-Ω resistors. How much power does either resistor dissipate all by itself?
(a) 150 mW
(b) 300 mW
(c) 1.2 W
(d) 4.8 W
(e) 9.6 W

18. For a battery-powered DC device, let's say that V represents the battery voltage in volts, I represents the circuit current in amperes, and R represents the circuit resistance in ohms. Which of the following formulas correctly portrays Ohm's law?
(a) $I = R / V$
(b) $V = IR$
(c) $R = I / V$
(d) $R = VI$
(e) $I = VR$

19. The number of electrons in an atom's nucleus is
(a) the atomic weight.
(b) the atomic number.
(c) the valence number.
(d) the charge number.
(e) zero.

20. We can express the rate at which moving charge carriers pass a fixed point in a wire as
(a) amperes.
(b) coulombs.
(c) volt-seconds.
(d) watts.
(e) watt-seconds.

Schematic P1-2.



21. In the circuit of Schematic P1-2, how much potential difference exists across the 100-Ω resistor?
(a) 3 V
(b) 6 V
(c) 9 V
(d) 12 V
(e) We need more information to calculate it.

22. If we connect 100 resistors, each rated at 47 Ω and ó W, in a 0.5W, 10 x 10 series-parallel network, we'll end up with a 47-Ω resistor capable of dissipating up to
(a) 2 W.
(b) 5 W.
(c) 20 W.
(d) 50 W.
(e) 100 W.

23. The standard unit of DC potential difference is the theoretical equivalent of
(a) an ohm-volt.
(b) a volt-ampere.
(c) an ohm-ampere.
(d) a watt-ohm.
(e) a watt-ampere.

24. Why should you never use a lead-acid automotive battery to power-up an electromagnet?
(a) Oh, but you should! That type of battery is ideal for electromagnets.
(b) The electromagnet will not have the correct polarity.
(c) Too much residual magnetism will occur.

(d) Dangerous acid might boil out of the battery.
(e) The battery will not provide enough current.

25. We can wind a coil of wire around a hiker's compass to make a simple
(a) voltmeter.
(b) wattmeter.
(c) galvanometer.
(d) potentiometer.
(e) electromagnet.

26. In order to get a readable, intuitive indication of a fluctuating current level, even if not especially precise, we would want
(a) an electrometer.
(b) an analog meter.
(c) a bar-graph meter.
(d) a digital meter.
(e) a decibel meter.

27. Which of the following cell types has the best energy density?
(a) Lead-acid
(b) Alkaline
(c) NiMh
(d) Zinc-carbon
(e) LiPo

28. The term proton-exchange-membrane refers to a type of
(a) fuel cell.
(b) dry cell.
(c) standard cell.
(d) wet cell.
(e) solar cell.

29. A 'chip' resistor with markings of 6803 has what ohmic value?
(a) 68.03 Ω
(b) 68 Ω
(c) 6.8 k
(d) 680 k
(e) 6.8 M

30. We might install a wirewound resistor
(a) to dissipate DC power.
(b) in a circuit in which inductance can't be tolerated.
(c) across the primary winding of a step-down transformer.
(d) across the secondary winding of a step-up transformer.
(e) across a battery to increase its voltage.

31. A material with permeability greater than 1
(a) concentrates magnetic flux relative to a vacuum.
(b) allows a magnetic field to exist, whereas a vacuum does not.
(c) exhibits lower retentivity than a vacuum.
(d) dilates magnetic flux relative to a vacuum.
(e) completely blocks magnetic fields.

32. The nucleus of an atom
(a) contains at least one neutron.
(b) contains at least one electron.
(c) never contains any neutrons.

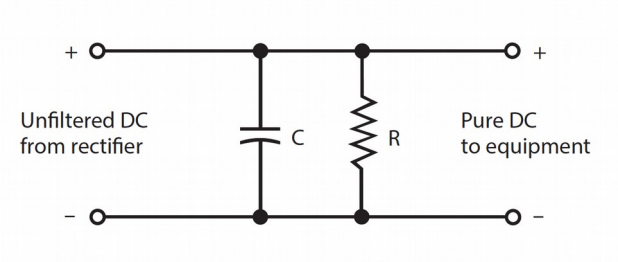
(d) always has an electric charge.
(e) always produces X rays.

33. Consider four resistors, each quoted at 220 Ω ±5% by the manufacturer. We measure their actual resistances with a precision ohmmeter and get the following readings. Which resistor fails to meet the manufacturer's claimed specification?
(a) The first resistor, which tests at 208 Ω.
(b) The second resistor, which tests at 233 Ω.
(c) The third resistor, which tests at 234 Ω.
(d) The fourth resistor, which tests at 207 Ω.
(e) All four resistors fail to meet the manufacturers claimed specification.

34. We can theoretically represent an electrical charge quantity in terms of
(a) volt-seconds.
(b) watt-seconds.
(c) ohm-seconds.
(d) siemens-seconds.
(e) ampere-seconds.

35. We connect a 24-V battery across a set of four resistors in parallel. The resistors have values of 100, 200, 300, and 400 Ω. How much current does the 300-Ω resistor draw?
(a) 24 mA
(b) 30 mA
(c) 60 mA
(d) 80 mA
(e) We need more information to calculate it.

Schematic P1-3



36. What purpose does capacitor C in Schematic P1-3 serve?
(a) It smooths out the ripple from the input DC.
(b) It increases the voltage across resistor R.
(c) It limits the voltage across equipment connected to the output.
(d) It protects resistor R against damage from current surges.
(e) It enhances the ability of resistor R to limit the voltage.

37. We can theoretically express DC resistance in terms of
(a) volts per ampere.
(b) volt-amperes.
(c) amperes per volt.
(d) volt-siemens.
(e) siemens per ampere.

38. Which, if any, of the following statements concerning potentiometers holds true?
(a) All potentiometers function in high-power DC circuits.
(b) All potentiometers exhibit inductive reactance.
(c) Some potentiometers can measure extremely high voltages.

(d) All potentiometers have wirewound elements.
(e) None of the above

39. We connect the end terminals of a multiple-turn, circular wire loop to a resistive load, place a powerful bar magnet inside the loop, and then keep the loop fixed with respect to the magnet. We will observe
(a) no current in the load.
(b) a change in the load resistance.
(c) an alternating magnetic field in the load.
(d) a DC voltage across the load.
(e) a steady magnetic field in the load.

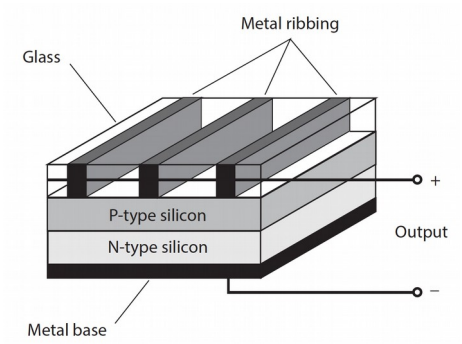
40. A positively charged atom always has
(a) more electrons than protons.
(b) more protons than electrons.
(c) the same number of protons and electrons.
(d) more neutrons than protons.
(e) more protons than neutrons.

41. In DC electrical circuits, the term power refers to the instantaneous rate at which
(a) voltage changes.
(b) current changes.
(c) energy is expended.
(d) charge quantity accumulates.
(e) conductivity varies.

42. We connect a 36-V battery to a set of three resistors in series, having values of 3.0, 4.0, and 5.0 Ω. How much potential difference appears across the 4.0-Ω resistor?
(a) 9.0 V
(b) 12 V
(c) 15 V
(d) 18 V
(e) 24 V

43. Which of the following statements is false?
(a) In a parallel-connected set of resistors, the current is the same at every point.
(b) The voltage across a parallel-connected set of resistors divides equally among them.
(c) The current in a series-connected set of resistors depends on which particular resistor we look at.
(d) The net ohmic value of a parallel-connected set of resistors exceeds the ohmic value of the largest individual resistor.
(e) All of the above statements are false.

Figure P1-4



44. What type of cell does Fig. P1-4 illustrate?
(a) A silicon-zinc cell
(b) A fuel cell
(c) A PV cell
(d) A barred metallic cell
(e) A LiPo cell

45. Under ideal conditions and with no load, the cell shown in Fig. P1-4 will put out
(a) 0.6 V DC.
(b) 1.2 V DC.
(c) 1.5 V DC.
(d) 1.8 V DC.
(e) 2.1 V DC.

46. Suppose that an atom of carbon, whose nucleus usually harbors six protons and six neutrons, has eight neutrons instead. We can call it
(a) an isotope.
(b) a compound.
(c) a cation.
(d) an anion.
(e) an ion.

47. An advantage of a lead-acid battery over a zinc-carbon battery is the fact that the lead-acid battery
(a) provides more voltage.
(b) can be discharged and recharged many times.
(c) can produce DC from visible light.
(d) has greater mass per unit of energy output.
(e) does not contain toxic carbon.

48. A DC electromagnet
(a) has constant polarity.
(b) requires an air core.
(c) requires a high-resistance coil.
(d) has polarity that periodically reverses.
(e) behaves exactly like an AC electromagnet.

49. Which of the following properties is an asset of PV cells?
(a) Their recharge capability makes them ideal for use in cell phones and tablets.
(b) Their large energy-storage capacity makes them useful in large appliances.
(c) Their lack of inductance or capacitance makes them useful in radio transmitters.
(d) Their high voltage allows them to directly replace lantern and automotive batteries.
(e) Their sensitivity to light makes them good for use in small solar-powered devices.

50. An analog voltmeter's mechanism directly measures
(a) frequency.
(b) current.
(c) power.
(d) energy.
(e) charge.

Answers:
1. c, 2. d, 3. c, 4. d, 5. a, 6. e, 7. e, 8. a, 9. e, 10. d, 11. a, 12. c, 13. c, 14. e, 15. e, 16. b, 17. c, 18. b, 19. e, 20. a, 21. b, 22. d, 23. c, 24. d, 25. c, 26. b, 27. e, 28. a, 29. d, 30. a, 31. a, 32. d, 33. e, 34. e, 35. d, 36. a, 37. a, 38. e, 39. a, 40. b, 41. c, 42. b, 43. e, 44. c, 45. a, 46. a, 47. b, 48. a, 49. e, 50. b