Circuit Lab B - Circuit Lab rev.1.04 - December 19 SO Practice - 12-19-2020

Just remember, this test is *supposed to be hard* because everyone taking this test is *really smart*.

Historical Perspective of Electricity

1. (1.00 pts) The first evidence of electricity in recorded human history was…

- ○ A) in 1752 when Ben Franklin flew his kite in a lightning storm.
- ○ B) in 1600 when William Gilbert published his book on magnetism.
- ○ C) in 1708 when Charles-Augustin de Coulomb held a lecture stating that two bodies electrified of the same kind of Electricity exert force on each other.
- ○ D) in 1799 when Alessandro Volta invented the voltaic pile which proved that electricity could be generated chemically.
- ○ E) in 1776 when André-Marie Ampère invented the electric telegraph.
- ○ F) about 2500 years ago when Thales of Miletus noticed that a piece of amber attracted straw or feathers when he rubbed it with cloth.

2. (3.00 pts) The word electric…

(Mark **ALL** correct answers)

- ☐ A) was first used in printed text when it was published in William Gilber's book on magnetism.
- ☐ B) comes from the Greek word ήλεκτρο (aka "electron") meaning amber.
- ☐ C) adapted the meaning "charged with electricity" in the 1670s.
- ☐ D) was first used by Nicholas Callen in 1799 to describe mail transmitted over telegraph wires, "electric-mail" or "email".
- ☐ E) was cast in stone by Greek emperor Julius Caesar when he knighted Archimedes for inventing the electric turning lathe.
- ☐ F) was first used by Michael Faraday when he described electromagnetic induction in 1791.

3. (5.00 pts) Which five people, who made scientific discoveries related to electricity, were alive at the same time?

(Mark **ALL** correct answers)

- ☐ A) Charles-Augustin de Coulomb
- ☐ B) Alessandro Volta
- ☐ C) André-Marie Ampère
- ☐ D) Georg Simon Ohm
- ☐ E) Michael Faraday
- ☐ F) Gustav Robert Kirchhoff

4. (1.00 pts) Which person coined the term “battery” to describe his device that could store electric charge using interconnected Leyden jars?

- A) Ben Franklin
- B) Charles-Augustin de Coulomb
- C) Alessandro Volta
- D) André-Marie Ampère
- E) Georg Simon Ohm
- F) Michael Faraday

5. (1.00 pts) The battery made from Leyden jars was most similar to?

- A) The 12v battery (lead-acid) we find in a car or truck
- B) The 9v battery (dry-cell) you can hold in the palm of your hand
- C) The Lithium-Ion battery commonly found in smart-phones
- D) A group of interconnected transformers
- E) A group of interconnected capacitors
- F) A group of interconnected lemons

6. (1.00 pts) John Frederic Daniel, William Sturgeon and William Cruickshank each made improvements to this invention?

- A) Ben Franklin's kite
- B) Charles-Augustin de Coulomb’s torsion balance
- C) Allessandro Volta’s voltaic pile
- D) André-Marie Ampère’s solenoid
- E) Charles Wheatstone’s Wheatstone Bridge
- F) Nikola Tesla’s car

7. (3.00 pts) Put the following inventions in order (left = oldest device; right = most recently invented device)
Hint: if you think that the Voltaic Pile was invented first and the LED was last, then “**D**” would be more left and “**E**” would be more right, such as: **D** – ? – ? – **E**

A)Wozniak & Job’s Apple Computer
B)Wheatstone’s Bridge
C)Coulomb’s torsion balance
D)Volta’s Voltaic Pile
E)the LED
F)Tesla’s Induction Motor

- A) B – C – D – F – E – A
- B) F – E – D – C – A – B
- C) B – E – D – C – F – A
- D) C – D – B – F – E – A
- E) A – C – D – B – F – E
- F) C – B – F – D – E – A

8. (1.00 pts) The Wheatstone Bridge would have been most useful to which of the following?

- A) a mason trying to build a bridge from stone and wheat
- B) a baker trying to build a cake bridge from wheat and pop-rocks
- C) Charles-Augustin de Coulomb, who could have used it to figure out the amount of capacitance of a mystery Layden jar
- D) Georg Simon Ohm, who could have used it to determine the amount of resistance of a material
- E) André-Marie Ampère, who could have used it to measure the Henrys of a mystery inductor
- F) Joseph Henry, who could have figured out how many 'Georg Simon Ohms' it takes to change a light bulb

9. (1.00 pts) Which person made use of the inventions or discoveries made by the other five?

- A) Charles-Augustin de Coulomb
- B) Alessandro Volta
- C) André-Marie Ampère
- D) Georg Simon Ohm
- E) Michael Faraday
- F) Nicola Tesla

10. (1.00 pts)
Which of the following people (or person) debunked the prevalent theory that electricity was generated by living beings (aka Animal Electricity)? Before this, people believed Luigi Galvani's theory that electricity was only created by 3 things (1) in nature – lightning (2) artificially (friction forces such as rubbing amber with cloth (3) Animal Electricity – nerve tissues.

- A) Charles-Augustin de Coulomb
- B) Alessandro Volta
- C) André-Marie Ampère
- D) Georg Simon Ohm
- E) Michael Faraday
- F) Nicola Tesla

Properties of Electric Charges/Fields, Sources/Hazards of Electricity, Coulomb's Law, Capacitance

11. (1.00 pts)
Electric charges can impart an electrostatic force whose magnitude is directly proportional to the product of the magnitudes of charges and inversely proportional to the square of the distance between them.

True False

12. (1.00 pts)
The charge of 1 electron is 1 electrostatic unit (esu) where 1 Coulomb is 6.2415×10^{18} esu ***AND*** the electrostatic force the electron exerts is expressed as F = QE where Q is the charge value and E is the Electric Field strength.

True False

13. (1.00 pts) A Van de Graaff generator uses the triboelectric effect to generate DC power.

True False

14. (1.00 pts) Integrated Circuits can't be damaged by static discharge because the current is too small.

True False

15. (1.00 pts) The amount of charge a capacitor can hold relative to voltage applied (aka capacitance) is measured in Henrys, named after Joseph Henry.

True False

16. (1.00 pts) Capacitance represents the ability to store charge.

○ True ○ False

17. (1.00 pts)
The function Q = CV represents how much charge a capacitor can hold. Q (amount of charge) is measured in Coulombs. C stands for Capacitance. V stands for Voltage.

○ True ○ False

18. (1.00 pts) The function $U = \frac{1}{2} \cdot C \cdot V^2$ represents how much energy (in Joules) a capacitor has stored.

○ True ○ False

19. (1.00 pts) For capacitors that are wired in <u>series</u>, the total capacitance is $C_{total} = C_1 + C_2 + C_3 + \cdots + C_n$

○ True ○ False

20. (1.00 pts) Gauss's law states that the electric flux passing out of a closed surface (i.e, the Gaussian surface) is equal to the total current within the surface.

○ True ○ False

Direct Current (DC) characteristics, sources, uses, simple circuit diagrams, hazards

21. (1.00 pts) Who was a champion of DC and opposed AC electrification?

○ A) George Westinghouse
○ B) George Washington
○ C) Ben Franklin
○ D) Thomas Jefferson
○ E) Thomas Edison
○ F) Thales of Miletus

22. (1.00 pts) Which devices are capable of providing steady DC power to a circuit?

(Mark **ALL** correct answers)
☐ A) an Alternator
☐ B) a Battery
☐ C) a Capacitor
☐ D) a Diode
☐ E) the outlet in your house that you can plug a normal toaster into
☐ F) a Solar Cell (yes, of course the sun is shining on it - duh!)

23. (2.00 pts) Which are passive, linear components of a DC circuit

(Mark **ALL** correct answers)

- ☐ A) an LED
- ☐ B) a battery
- ☐ C) a capacitor
- ☐ D) a diode
- ☐ E) a resistor
- ☐ F) a magnet spinning at exactly 60 rotations per second next to a candle

24. (1.00 pts)
A black box containing only voltage & current sources, and resistances, can be replaced by an equivalent circuit consisting of one equivalent current source in parallel with one equivalent resistance. This is a practical definition of...

- ○ A) Einstein's Theory of Relativity
- ○ B) Ohm's Law
- ○ C) Tesla's Postulate
- ○ D) Norton's Theorem
- ○ E) a Wimshurst machine
- ○ F) what remained of Ben Franklin's kite after lightning struck it

25. (1.00 pts) The reciprocal of resistance (measured in Ohms) is conductance. Conductance is measured in:

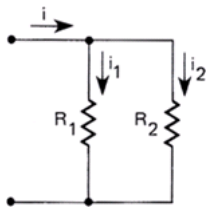
- ○ A) millihenrys
- ○ B) farads
- ○ C) decibels
- ○ D) mhos
- ○ E) schmos
- ○ F) schmucks

26. (1.00 pts) The equation $R_e = R_1 + R_2 + R_3$ represents resistors that are connected in:

- ○ A) parallel
- ○ B) tandem
- ○ C) fandom
- ○ D) fathom
- ○ E) stardom
- ○ F) series

27. (1.00 pts)

The following diagram is an example of a _____ divider.

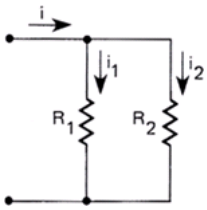


- ○ A) resistor
- ○ B) joule

- C) voltage
- D) current
- E) charge-coupled
- F) inductive

28. (2.00 pts)

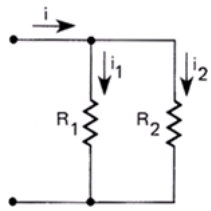
If R_1 = 15 ohms and R_2 = 10 ohms, what would be the equivalent resistance of the combined devices?



- A) 150 ohms
- B) 25 ohms
- C) 15 ohms
- D) 10 ohms
- E) 6 ohms
- F) 3 ohms

29. (2.00 pts)

If you go online, you can buy a 12 volt car battery with "800 cold cranking amps" for about $90. It will weigh about 40 pounds. Now, imagine if you hooked up that battery to this circuit. How many amps of current would be flowing out of the car battery? (assume the resistor values are the same as the last problem R_1 = 15 ohms and R_2 = 10 ohms)



- A) 800 amps
- B) 400 amps
- C) 133 amps
- D) 2 amps
- E) 1.2 amps
- F) 0.8 amps

30. (2.00 pts)

If you really did hook up a 12 volt "800 cold cranking amps" lead-acid car battery to two common quarter-watt resistors wired in parallel where R_1 = 15 and R_2 = 10 ohms, what would happen to the resistors?

- A) They would explode/vaporize instantly. 800 amps is an outrageous amount of electrical power pushing through tiny quarter-watt resistors!
- B) Nothing destructive or bad - that configuration is not hazardous. It's just 12 volts of electrical potential and any quarter watt resistor can handle that.
- C) The resistors will get hot, begin to smoke and eventually fail. The resistors are overloaded by 9.6 and 14.4 watts of power, respectively.
- D) The resistors will get white hot, like the filament of an incandescent light bulb, and glow brightly.
- E) It's like dividing by zero - you simply are not allowed to do this - the battery will give you an error message via your bluetooth-enabled smartphone.
- F) The resistors will emit gamma radiation. If you're anywhere near them, you'll turn into the Incredible Hulk.

Direct Current (AC) characteristics, sources, uses, hazards

31. (1.00 pts) Which device can provide clean, sinusoidal power to an AC circuit?

- A) a Wimshurst machine
- B) a battery
- C) a capacitor
- D) a Van de Graaff generator
- E) the outlet in your house that you can plug a normal toaster into
- F) a Solar Cell (yes, same as before, assume the sun is shining)

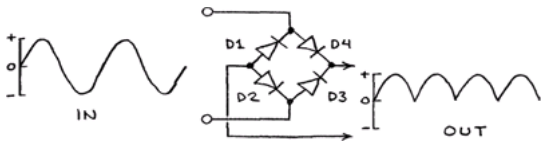
32. (1.00 pts) Who as a champion of AC and opposed DC electrification?

- A) George Westinghouse
- B) George Washington
- C) Ben Franklin
- D) Thomas Jefferson
- E) Thomas Edison
- F) Thales of Miletus

33. (1.00 pts) AC became the standard for transmitting electrical power across the United States because

- A) DC works in cars, trucks, RVs & boats, but not houses
- B) in 1903, industry leaders who supported AC released a film featuring Topsy the elephant showing how much safer AC was than DC
- C) in the spring of 1888, electric lighting companies featured electrical pole climbers in newspaper ads, as a public relations campaign
- D) to minimize power lost across transmission lines, transformers could step-up voltage & step-down current using AC but not DC
- E) the electric toaster, a very popular consumer appliance in 1910, worked with AC but not DC
- F) the electric street lamps that replaced gas lamps in big cities only worked with AC

34. (1.00 pts) The figure below shows as full wave _____ which is the first step in converting AC to DC.



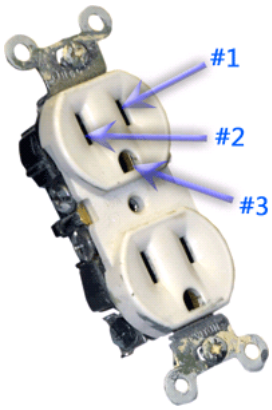
- A) alternator
- B) battery
- C) capacitor
- D) diode
- E) resistor
- F) rectifier

35. (1.00 pts) An AC motor

- A) can be replaced by a DC motor. They work exactly the same way so they're interchangeable.
- B) uses brushes in contact with a slip ring commutator and an armature rotating in a magnetic field.
- C) uses a stationary stator and a rotor rotating in a magnetic field. It costs less to maintain because an AC induction motor doesn't use brushes that wear out over time.
- D) comes in 3 varieties: stepper motor, servo motor and linear motor.
- E) will spin in the opposite direction if you swap the Hot & Neutral wires; just like a DC motor spins in the opposite direction if you reverse the power supply polarity.
- F) doesn't exist. All motors are DC motors!

36. (3.00 pts)

Select all the answers that are true statements about the typical USA household outlet seen here:

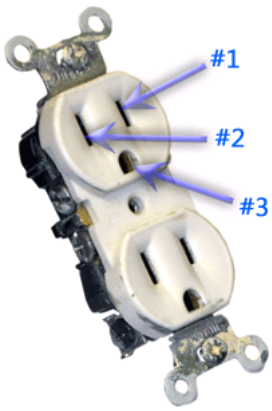


(Mark **ALL** correct answers)

- A) #1 = 120v DC, #2 = 0v DC, #3 = 0v DC
- B) #1 = 120v AC, #2 = 0v, #3 = 0v
- C) #1 = HOT, #2 = Neutral, #3 = Ground
- D) #1 is connected to a black or red wire; #2 is connected to a white wire; #3 is connected to a green wire
- E) #1 carries supply current to your appliance, #2 carries return current from your appliance, #3 carries no current
- F) Regardless where you travel all over the world, household outlets all look and function the same.

37. (1.00 pts)

Terminal #1 supplies what kind of power?



- A) 120 volts of DC power, and typically a maximum of "800 cold cranking amps"
- B) 120 volts of AC power at 50 Hz, and typically a maximum of 50 amps
- C) 120 volts of AC power at 60 Hz, and typically a maximum of 15 amps
- D) 12 volts of AC power at 60 Hz, and typically a maximum of 150 amps
- E) 240 volts of AC power at 50 Hz, and typically a maximum of 10 amps
- F) #1 is the neutral conductor - it provides no power

38. (1.00 pts)
This is a circuit breaker found in most homes in America. You can find it in your home's electrical panel. The reason you have circuit breakers is...

- A) they are fashionable and ornamental. Your circuit breaker panel would look boring without them.
- B) they're supposed to help prevent a fire by limiting the current to 15 amps.
- C) they prevent appliances from giving you static shock by limiting the electrical charge to 15 coulombs.
- D) they insure every appliance has 15 joules of energy.
- E) they step the transmission line voltage down to 15 volts AC.
- F) they limit parasitic voltages to 120 +/- 15v

Concepts and units of current, voltage, resistance, power, energy and using Ohm's Law

39. (2.00 pts) Calculate how many AA batteries would give you the equivalent voltage of a 12v car battery if you connected the AA batteries in series.

- A) 2 batteries
- B) 4 batteries
- C) 8 batteries
- D) 12 batteries
- E) 16 batteries
- F) 24 batteries

40. (2.00 pts)
A brand new alkaline AA battery can provide about 7 amps for one second while maintaining its rated 1.5 volts. Calculate how many batteries you would have to wire in parallel in order to provide 350 amps.

- A) 343 batteries
- B) 233 volts
- C) 233 batteries
- D) 100 amps
- E) 75 joules
- F) 50 batteries

41. (2.00 pts)
How many AA batteries would you need to wire together to create the equivalent of a 12 volt lead-acid car battery that can supply a motor starter 350 amps for 1 second?

- A) 264 batteries
- B) about 44 batteries, give or take a battery
- C) 400 batteries

- D) no more than 350 batteries
- E) about 200 batteries, give or take 5
- F) This is a trick question. You can not create the equivalent of a 12 volt, 350 amp battery no matter how you wire any number of AA batteries.

42. (2.00 pts)
If you had a 12 volt battery that could deliver 350 amps of power to a car's motor starter circuit for 2 seconds, how much power would your battery deliver to your motor starter's circuit?

- A) 4200 joules
- B) 8400 watts
- C) 4.2 kw
- D) 700 coulombs
- E) 58.3 farads
- F) 4200 ohms

43. (3.00 pts) How much chemical energy of a 12v car battery is converted into electrical energy if it delivers 350 amps for 2 seconds in order to start your SUV?

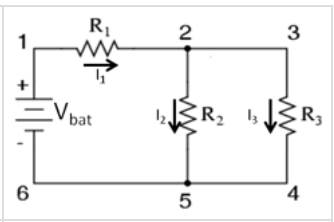
- A) 4200 joules
- B) 8400 watts
- C) 4.2 kw
- D) 2100 coulombs
- E) 58.3 farads
- F) 8.4 kilojoules

44. (3.00 pts) How many electrons would have flowed through your circuit if your 12v car battery delivered 350 amps for 2 seconds in order to start your SUV?

- A) 700 electrons
- B) about 4.37 million electrons
- C) 2.1 billion electrons
- D) 700 million electrons
- E) 2.1 trillion electrons
- F) about 4.37×10^{21} electrons

45. (2.00 pts)

Given $R_1 = 50\Omega$, $R_2 = 140\Omega$, $R_3 = 140\Omega$ and, given the following circuit, calculate the equivalent resistance, R_{eq}, of the resistor network. In other words, if there was no battery and you took a multimeter and measured the resistance between point 1 and point 5, what would it be?

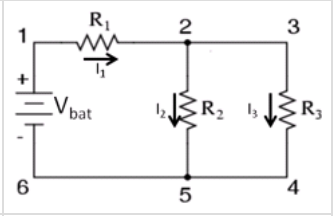


- A) 3.5 kΩ
- B) 330 Ω
- C) 120 Ω
- D) 110 Ω

- E) 95 Ω
- F) 5.6 Ω

46. (3.00 pts)

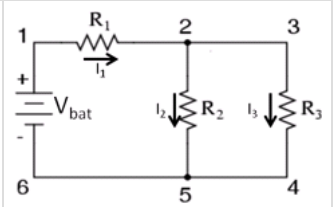
Given R_1 = 50Ω, R_2 = 140Ω, R_3 = 140Ω, V_{bat} = 12v and, given the following circuit, calculate the current, I_2 , flowing through R_2.



- A) 800 cold cranking amps
- B) 350 cold cranking amps
- C) 7 amps
- D) 5 amps
- E) 0.7 amps
- F) 50 milliamps

47. (3.00 pts)

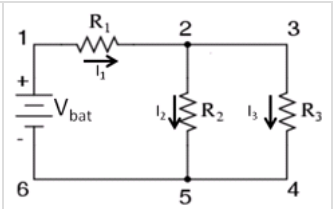
Given R_1 = 50Ω, R_2 = 140Ω, R_3 = 140Ω, V_{bat} = 12v and, given the following circuit, calculate the voltage drop across R_3.



- A) 800 volts
- B) 350 volts
- C) 7 volts
- D) 5 volts
- E) 0.7 volts
- F) 50 millivolts

48. (3.00 pts)

Given R_1 = 50Ω, R_2 = 140Ω, R_3 = 140Ω, V_{bat} = 12v and, given the following circuit, calculate the power being dissipated by R_1.



- A) 0.5 joules
- B) 50 watts
- C) 50 coulombs
- D) 500 millijoules
- E) 500 milliwatts
- F) 500 millicoulombs

Magnetic poles/fields, electromagnets, transformers, motors/generators, right-hand rule

49. (1.00 pts) An electron can exert a magnetic force as it travels down a wire, where the force is expressed by the formula $F = qvB\sin(\theta)$

○ True ○ False

50. (1.00 pts) A photon can exert a magnetic force as it travels down an optical fiber.

○ True ○ False

51. (1.00 pts) 1 Tesla = 1 Newton per (Coulomb × m/s) where a (Coulomb per second) is an amp

○ True ○ False

52. (1.00 pts) An electromagnet can be powered by either an AC or a DC power source.

○ True ○ False

53. (1.00 pts) A transformer can step-up or step-down Watts of power depending on the number of windings.

○ True ○ False

54. (1.00 pts)
AC power will transfer across a transformer but DC power will not. Therefore, if you wanted to remove a DC bias from an AC signal, you could use a transformer to do that.

○ True ○ False

55. (1.00 pts) A generator converts mechanical power into electrical power.

○ True ○ False

56. (1.00 pts)
You can convert mechanical power into either DC power or AC power. In both cases you use permanent magnets that induce currents in coils. The difference lies in how you build your device.

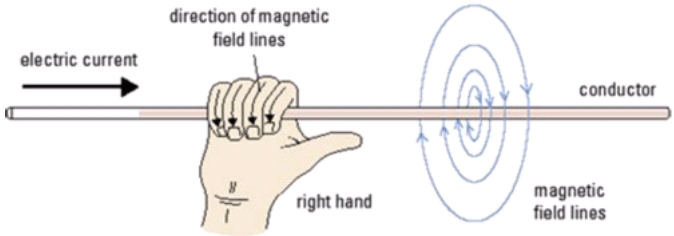
○ True ○ False

57. (3.00 pts)
An AC generator (aka an alternator) consists of 1200 turns of wire, each of an area A=0.003 m^2 and a total resistance of 9 Ω. The loop rotates in a magnetic field B = 0.125 Tesla at a constant frequency of 60 Hz. Find the maximum induced electromotive force (rounded to the nearest volt). Hint: $\mathcal{E}_{max} = N \times A \times B \times \omega$ where $\omega = 2\pi \times f$

○ A) 1.53 kV AC (peak value; not RMS)
○ B) 243 V AC (peak value; not RMS)

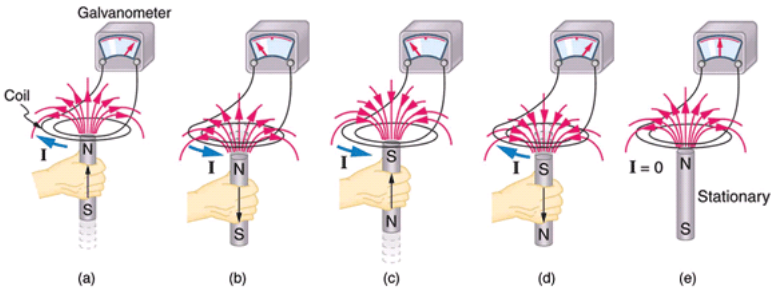
- C) 170 V AC (peak value; not RMS)
- D) 18.8 V AC (peak value; not RMS)
- E) 3 V AC (peak value; not RMS)
- F) This is a trick question! You can *NOT* convert mechanical force into electricity.

58. (1.00 pts) This image accurately expresses the right hand rule.



- True
- False

59. (1.00 pts)
This image accurately expresses the direction of current flow based on the movement of the bar magnet.



- True
- False

Electrical Devices

60. (1.00 pts) Name the device that this symbol represents. 

- A) AC Voltage source
- B) battery
- C) capacitor
- D) LED
- E) resistor
- F) fuse

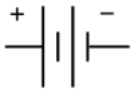
61. (1.00 pts) Name the device that this symbol represents. 

- A) AC Voltage source
- B) battery

- C) capacitor
- D) LED
- E) resistor
- F) fuse

62. (1.00 pts)

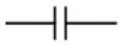
Name the device that this symbol represents.



- A) AC Voltage source
- B) battery
- C) capacitor
- D) LED
- E) resistor
- F) fuse

63. (1.00 pts)

Name the device that this symbol represents.



- A) AC Voltage source
- B) battery
- C) capacitor
- D) LED
- E) resistor
- F) fuse

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Simple calculations based on circuit components

66. (1.00 pts) If you have the following 4 resistors (R_1 = 20Ω, R_2=50Ω. R_3=100Ω, R_4=50Ω) in series, what would the equivalent resistance be?

- A) 5 Ω
- B) 10 Ω
- C) 50 Ω
- D) 100 Ω
- E) 220 Ω
- F) 5 kΩ

67. (2.00 pts) If you have the following 4 resistors (R_1 = 20Ω, R_2=50Ω. R_3=100Ω, R_4=50Ω) in parallel, what would the equivalent resistance be?

- A) 5 Ω
- B) 10 Ω
- C) 50 Ω
- D) 100 Ω
- E) 220 Ω
- F) 5 kΩ

68. (2.00 pts) If you have the following 4 capacitors (C_1 = 20μF, C_2=50μF. C_3=100μF, C_4=50μF) in series, what would the equivalent capacitance be?

- A) 5 μF
- B) 10 μF
- C) 50 μF
- D) 100 μF
- E) 220 μF
- F) 5 mF

69. (1.00 pts) If you have the following 4 capacitors (C_1 = 20μF, C_2=50μF. C_3=100μF, C_4=50μF) in parallel, what would the equivalent capacitance be?

- A) 5 μF
- B) 10 μF
- C) 50 μF
- D) 100 μF
- E) 220 μF
- F) 5 mF

70. (1.00 pts) How much current can a 25 Ω, quarter watt resistor resistor handle safely?

- A) 0.1 kiloamps
- B) 0.01 amps
- C) 10 milliamps
- D) 100 milliamps
- E) 1 amp
- F) 10 amps

71. (1.00 pts) How much voltage can a 100 Ω, quarter watt resistor resistor handle safely?

- A) 1 volt
- B) 5 volts
- C) 12 volts
- D) 24 volts
- E) 25 volts
- F) 120 volts AC

72. (1.00 pts) How many coulombs of charge will a 960 μF capacitor accumulate if it is attached to a 12 volt battery?

- A) 11520 Coulombs
- B) 972 Coulombs
- C) 80 Coulombs
- D) 11.52 milliCoulombs
- E) 8 milliCoulombs
- F) 11.52 μC

73. (1.00 pts) How many joules of energy would be extracted from a 12 volt battery if a 960 μF capacitor was briefly connected to it, until the capacitor was fully charged?

- A) 138240 joules
- B) 11520 joules
- C) 972 joules
- D) 138.24 microjoules
- E) 13.82 microjoules
- F) 11.52 microjoules

Fundamental characteristics and operation of a LED

74. (0.00 pts) A green LED is likely made from:

- A) Silicon embedded in a green translucent plastic
- B) AlGaP
- C) GaAs

D) GaAsP
E) ZnSe
F) AlGaN

75. (0.00 pts) A blue LED is likely made from:

A) Silicon imbedded in a blue translucent plastic
B) AlGaP
C) GaAs
D) GaAsP
E) ZnSe
F) AlGaN

76. (0.00 pts) A red LED is likely made from

A) Silicon embedded in a red translucent plastic
B) AlGaP
C) GaAs
D) GaAsP
E) ZnSe
F) AlGaN

77. (1.00 pts) An LED is made from a semiconductor PN junction. This PN junction can emit light when energy is release by

A) electrons in the conduction band recombining with holes in the valence band
B) electrons in the outer shell smacking into protons in the atomic nucleus
C) protons in the conduction band recombining with electrons in the valence band
D) electrons in the conduction band recombining with positrons also in the valence band
E) negative ions in the conduction band recombining with protons in the valence band
F) protons in the valence band recombining with electrons in the conduction band

78. (1.00 pts) An LED is a PN junction diode whose band-gap aligns with an energy level of a photon with a wavelength in the visible light spectral range.

True False

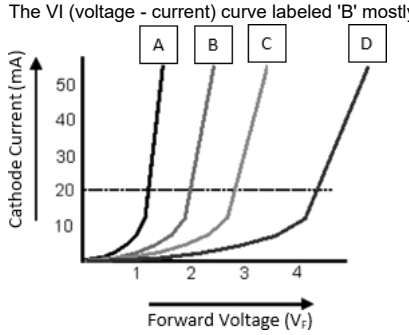
79. (1.00 pts)
The LED semiconductor forms a crystal lattice. When a bond between atoms within the lattice is broken, a void called a hole is created. This hole can move in the lattice as a result o
nearby, bound, valence electrons moving to fill the void.

True False

80. (1.00 pts) Empty states (holes) in the valence band are negative charge carriers.

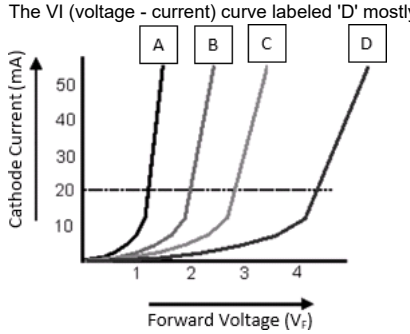
True False

81. (1.00 pts) The VI (voltage - current) curve labeled 'B' mostly closely represents which color LED?



- A) Ultraviolet
- B) Blue
- C) Orange/Amber
- D) Red
- E) Infrared
- F) Microwave

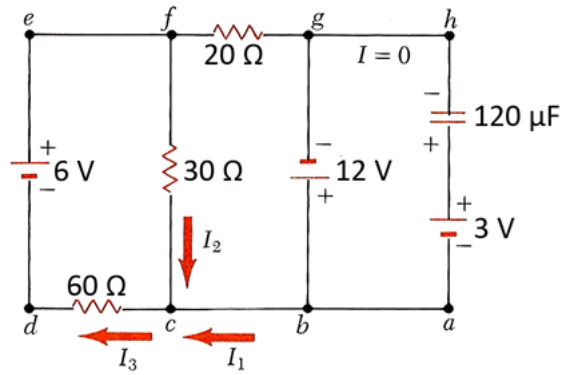
82. (1.00 pts) The VI (voltage - current) curve labeled 'D' mostly closely represents which color LED?



- A) Ultraviolet
- B) Blue
- C) Orange/Amber
- D) Red
- E) Infrared
- F) Microwave

Circuit analysis using Kirchhoff's Voltage & Current Laws

Use the following diagram to answer the last few questions.
HINTs: Kirchhoff's loop equation can be applied to any closed loop including the one containing the capacitor. At steady-state conditions, a capacitor acts like an open circuit.



83. (3.00 pts) Under steady-state conditions, calculate I_1.

- A) -167 mA
- B) 0 mA
- C) 167 mA
- D) 183 mA
- E) 350 mA
- F) 533 mA

84. (3.00 pts) Under steady-state conditions, calculate I_2.

- A) -167 mA
- B) 0 mA
- C) 167 mA
- D) 183 mA
- E) 350 mA
- F) 533 mA

85. (3.00 pts) Under steady state conditions, calculate I_3

- A) -167 mA
- B) 0 mA
- C) 167 mA
- D) 183 mA
- E) 350 mA
- F) 533 mA

86. (3.00 pts) Calculate the charge on the capacitor.

- A) 1800 Coulombs
- B) 15 Coulombs
- C) 120 μC

D) 1.8 millicoulombs

E) 15 μC

F) 1440 microcoulombs

I hope you thought about a squirrel, at least once, while you were taking this test. Now, have a FABULOUS rest of your day!