

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Score that you expect (out of 370): \_\_\_\_\_

Score of the Paper Test(out of 270): \_\_\_\_\_

Score of the Hands-On(out of 100): \_\_\_\_\_

### SHOCK VALUE TEST

Directions: This test was made so that you probably can't finish in 50 minutes, this is to see what topics you are good at, do what you know first, then try those you kinda know, then finally, after checking those you have done, hope, and put things that make sense in your mind, NO penalizing for wrong answers. Good luck!!! =D

(I) Definitions(50 points total) (2pts ea.)

1. In \_\_\_\_\_, the movement of electric charge will change directions.
2. A fuse is different from a \_\_\_\_\_, in the sense that a fuse cannot be reset.
3. The electricity that is obtained from certain types of crystals is called \_\_\_\_\_.
4. The capacitance of two plates is proportional to the relative \_\_\_\_\_ of the material between the plates and the area of the plates.
5. \_\_\_\_\_ current flows from plus to minus.
6. For parallel circuits of more than two resistors, the most common method to find the total resistance is the \_\_\_\_\_ method.
7. A \_\_\_\_\_ substance is difficult to magnetize, but once it is magnetized, it is magnetized in the opposite direction.
8. An electrolyte is full of ions, which accumulate at the \_\_\_\_\_ of a battery.
9. In a step up \_\_\_\_\_, the watts going into the primary coil is the same as the watts coming out of the secondary coil.
10. The unidirectional flow of electric charge is also called \_\_\_\_\_.
11. An electrical circuit is a special \_\_\_\_\_, that has a closed loop and a return path for the current.
12. The filament is the part that glows in a light bulb, it is made of \_\_\_\_\_ in incandescent bulbs and \_\_\_\_\_ in neon lamps.
13. The magnitude of charge of a \_\_\_\_\_ is the the same as an electron.
14. The \_\_\_\_\_ prevents the electrons from going directly from anode to cathode.
15. The oscilloscope measures \_\_\_\_\_ over \_\_\_\_\_.
16. LFS stands for \_\_\_\_\_.
17. Two circuits are \_\_\_\_\_ if a pair of terminals if the voltage across and current through the terminal of one have the same relationship as the voltage and current as the other.
18. MOSFET is short for \_\_\_\_\_.
19. The power-producing part of a generator is also known as \_\_\_\_\_.
20. A \_\_\_\_\_ is a rotary electrical switch that is in motors.
21. Lightning is an example of a(n) \_\_\_\_\_.
22. A fuse is an example of a type of \_\_\_\_\_.
23. The stationary part of a rotary electrical system is known as the \_\_\_\_\_.

(II) True and False (20 points total) (2pts ea.)

T/F 1. The magnetic field strength of a magnet is the same throughout the magnet.

T/F 2. The amount of current in a series circuit is always constant.

T/F 3. The resistance of an ammeter is 0.

T/F 4. One of two lightbulbs made of the same material will have a higher resistance if it has a thicker filament.

T/F 5. As a lightbulb heats up, its resistance increases.

T/F 6. A diamagnetic material and a ferromagnetic material are both magnetized in the same direction as the magnetic field.

T/F 7. A step-up transformer changes the watts that go into it.

T/F 8. A bar magnet will create electricity when it is dropped into a copper pipe.

T/F 9. A DC transformer is possible to make.

T/F 10. A solenoid has a constant magnetic field throughout it.

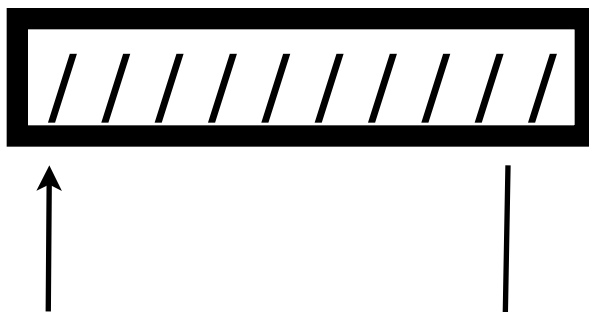
(III) Magnetism and Magnetism Concepts (50 points total) (pts weighted)

Part 1: Magnetic Fields

1. Draw Magnetic Fields around this magnet



2. Draw the magnetic field produced by the following loops of wire (arrow is where electrons flow into)



Part 2: Magnetic Concepts


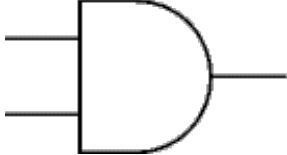

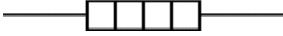

1. What magnetic pole do we live closer to?

2. Describe two ways I can magnetize an iron ingot, and two ways to immediately demagnetize this iron ingot, even though that would sort of be counter-productive as I just magnetized this iron ingot. I'm not going to judge myself

3. How is an electromagnet made using correct terms?
  
4. What are four ferromagnetic substances? Is NArWHA! ferro-, para-, or dia-magnetic?  
(actual question)
  
5. Do all domains in a magnet have to point in the same direction to be magnetized?
  
6. How do magnets work in motors?
  
7. Why are copper wires with current attracted to magnets but not normal copper wires?
  
8. How can the strength of electromagnets be increased?(4 ways)
  
9. I have made an electromagnet, but being a 5 year old, I scream,"IT'S MAGIC!!!"  
Explain to me why this is not magic, and how the electromagnet actually works.
  
10. I drive my metal car over a closed loop of wire that is somehow embedded into the  
asphalt, will the magnetic field of the earth within this magical loop be altered?  
(Yes or no)  
  
Will this create a current pulse?  
(Yes or no)  
  
Is there actually a practical application for this, or will it just look extremely weird in the  
middle of the road?  
(Not yes or no, please explain your thoughts)



Part 2: Schematic chart, and brief explanation as to what each thing does (26 points total, not every symbol is worth the same amount of points)

Circuit Breaker	Diode	Fuse	Battery
Lamp		Resistor, variable	Capacitor
	Push Switch		
	AC Supply	Junction	Cell

(V) Calculations(50 points total)

Part 1 Ohm's Law(20 points)

I feel weird today, so I decided make a bunch of random circuits with random resistors that I found. The 4 resistors that I somehow randomly found around in my room have values of  $243\Omega$ ,  $223\Omega$ ,  $556\Omega$ , and  $919\Omega$ . Complete the following tasks.

1. Construct a circuit of approximately  $466.4\Omega$ . Which resistor(s) has the most current through it?

2. Construct another circuit of approximately  $483.9\Omega$ . Which resistor(s) have the least current through it?

3. Construct a circuit of approximately  $354.1\Omega$ .

4. What is the sum of the combined resistance of the circuit with the least resistance and the circuit with the most resistance?

Part 2: Magical Calculations(10 points)(2pts. ea.)

I have a magical machine of awesomeness that tells me how much money I spend on each appliance around the house. I use this magical machine of awesomeness on my computer. I keep my computer on for about 360 days in 2012. My machine tells me that I spend about \$5324.18 that year. My parent’s electricity provider charges about 9.4 cents per kWh on a 120 volt outlet.

- (a) How many kWh did I use in 2012?
- (b) How many watts do I use?
- (c) How much money do I save keeping my computer off a few days of the year?
- (d) How much current does my computer have?
- (e) Due to that value, what is the value of magical resistance?

Part 3: Complete the following chart using the given information(algebra)(20 points)

Power(W)	Volts(V)	Current(I)	Resistance(R)
GIVEN $W=VI$ Watts=Volts x Resistance	Given $V=IR$ Volts=Current x Resistance		

(VI) Conceptual(50 points total)

1. What kills you, high voltage, or high current?
2. I walk on a high voltage power line, why am I still breathing?
3. In my high voltage room where I play with electricity, why would I make my room out of ceramic and wear ceramic SAPI plates?
4. What are some uses for magnets?(List at least 3)
5. A ferromagnetic substance is a substance that is easily magnetizes, why is it called ferro-?
6. I find a motor, generator, and a battery, they all look the same, in terms of energy, explain to me what the difference between these random combinations of metal and plastic are. (what types of energy does each convert)
7. I find a Lead-acid battery and a Lithium Polymer battery, explain to me why a lead-acid battery has a higher chance of killing me over a Lithium Polymer battery given that my hands are tied and can not play with either one.
8. Being myself, somehow I manage to hurt myself with the world's safest battery, I connect the anode and the cathode on my finger and forgot about it, explain to me why I smell burning skin.(Explain what a short circuit is and why it is dangerous)
9. A primary battery and a secondary battery, to my surprise, are not called this because one was better than the other, there is a difference, what is that difference?
10. I wired the magical earthquake motor backwards, what happens?
11. Seeing what happened to the magical earthquake motor, I decided to reverse the wiring of a circuit containing a lightbulb, what happens to this lightbulb?



12. Staring at a home-made battery in some random person's house, I can not resist the urge to take it apart, what electrodes might I find in this battery?(2 Chemicals that can create a battery)
  
13. A CFL bulb gives off less light than an incandescent bulb of the same watts. My logic was to test the heat of each bulb, on which bulb would I end up with a small burn, and with which bulb would I have a big, gaping hole(large burn) after touching it for one second?
  
14. I have access to every single element of the periodic table, I can only afford to buy one element and the shell of a lightbulb, and some wires with a battery. What element should I buy to get the equivalent of an incandescent lamp?
  
15. I stared at the lightbulb that I had magically created, and I wondered, what does incandescent mean?
  
16. What does a fuse do and how does it work?
  
17. Conceptually, NOT NUMERICALLY, why do resistors in parallel have less resistance than each resistor, and why do resistors in series have more resistance than each resistor?
  
18. I create a parallel and a series circuit, exactly like before, but with lightbulbs, of these two circuits, which one will shine brighter using the same lightbulbs?
  
19. An amp is 1 coulomb of charge moving per second, the elementary charge is  $1.602 \times 10^{-19}$ . The coulomb is named after a Charles Coulomb who discovered all of this. What is the value of the constant named after him, the Coulomb Constant?