Product Dissection & Benchmarking Project Handout II
Measurements and Dissection. Estimated time: 2 hours

Preparation before beginning the Lab:
Read *Noise Measurement* and *Electric Circuits* Handouts.

Section: 7_____
Team: 8_____
Members: **Jordan Janinek**_____
Evan Bedel_____
Sam Schmucker_____
Matt McClernand_____

Lab II Assignments:
Complete data sheet 2.

Laboratory Tools:
1. Camera
2. Sound intensity (Decibel) meter
3. Hack saw
4. Screw driver
5. Pliers
6. Multimeter
7. Connectors
8. Ziplock bags

I. Noise Measurement:

Tasks:
1. In a quite environment, place the Decibel meter's microphone close to the product running with no load. Record the decibel readings for various distances on data sheet 2.

II. Power Measurement:

Tasks:
1. Remove the battery (batteries) from the product place them on the workbench.
2. Using a multimeter, measure the voltage across the battery (or batteries placed in series). Record the voltage on data sheet 2.
3. Replace the battery (batteries) into their working positions, replace the battery cover, and turn the product on to ensure the batteries are placed correctly.
4. Measuring current under 'no load': Remove the battery cover and leave the batteries inside the product.
5. Connect a multimeter in series with the exposed ends of the batteries. The multimeter will thus complete the electric circuit.
6. Switch on the multimeter, set it to read current in milliamps (mA).

7. Turn on the product and record the current reading for the no load condition. Note that the reading will fluctuate a little. Record several readings and take the average. Turn the product off.
8. Measuring current under load. Repeat steps 5-7, except the toothbrush should be positioned with the bristles rubbing against the workbench (simulating brushing of teeth). The toothbrush should be pressed down with similar pressure as when brushing ones teeth. This will be the first 'under load' measurement.
9. Step 8 should be repeated with each group member taking a turn at simulating brushing. At the end of this step, there should be as many averaged 'under load' measurements as the number of team members.
10. Using the formula P=VI calculate the power required to run the product.
11. Assume that an average non-rechargeable battery has a capacity of 1000 mAh. Using the average power consumption 'under load' calculate how long (in hours) the tooth brush can run before the batteries die.
12. Estimate how long it takes (or you should take) to brush your teeth. Assuming you brush your teeth twice a day, calculate how many days use before you need to replace your batteries.

III. Dissection:

Tasks:

1. Disassemble, measure, and analyze function of each component. Record your findings in the Bill of Materials (BOM) table in data sheet 2 **(make sure you identify the team leader(s) for the dissection of each component). Make sure to note the start time and end time of the dissection for each component.**
2. Insert pictures or sketch components to the visuals table in data sheet 2. Indicate names of the components as you have given in the previous table. **Indicate who completed each drawing.**
3. Study and indicate (using a tree structure) how components, subassemblies, and final assembly relate to each other on data sheet 2.

DATA SHEET 2

1. Noise Measurement:

Location:	**Noise level: dB**
Brush head 4 in away from decibel meter	65.3
Brush head 3 in away from the decibel meter	66.5
Brush head 2 in away from decibel meter	67.4
Brush head 1 in away from the decibel meter	71.3
DC motor 4 in away from decibel meter	68.2
DC motor 3 in away from the decibel meter	69.1
DC motor 2 in away from the decibel meter	72.4
DC motor 1 in away from the decibel meter	73.3
Approximate duration of brushing per day:	2 minutes/day
Average noise level during brushing:	69.175 dB on average

2. Power Measurement:

Voltage supplied to the circuit:

	Battery Type	**Volts (V):**
Battery 1	AA	1.505
Battery 2	AA	1.511

Total Voltage:

	Connection Type	**Volts (V):**
Battery 1 and Battery 2	Series	3.016

Current Measurements	**Averaged Current Value**
No load condition	_____
Load condition(s)	
1.	_____
2.	_____
3.	_____
4.	_____

Mean current 'under load' _____

	Voltage		Current			
Power (no load) =	_____	X	_____	=	_____	Units_____
	Voltage		Current			
Power (under load) =	_____	X	_____	=	_____	Units_____

3. Battery Life

1. Number of hours available per single battery ‘under load’ conditions: _____ Hours

2. Estimate duration for each brushing _____ Hours

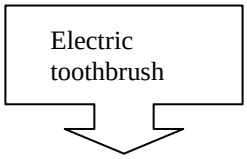
3. Number of days before battery replacement _____ Days

DATA SHEET 2 cont.

	Bill of Materials										
Product Manufacturer/Model Number:											
Date:											
Disassembly method: **Subtract and Operate Procedure (SOP): Yes, No.** **Force (Energy) Flow Diagram: Yes, No.**											
Team leader name(s)	**Part#**	**Part Name**	**QTY**	**SOP** Effect	**Function**	**Mass** (oz, g)	**Material**	**Manuf. Process**	**Dimensions**	**Cost**	**Time to Complete Part Dissection**

Visuals: Component pictures, sketches and/or solid models <u>(place team members name who completed each visual)</u>	

Component, subassembly, assembly hierarchy:



Assembly
Level

Sub-assembly
Level

Component
Level