Experiment 1

**Submission Template**

# The following should be included in your experimental checklist. Everything should be labeled and easy to find. Credit will be deducted for poor labeling or unclear presentation. ALL PLOTS SHOULD INDICATE WHICH TRACE CORRESPONDS TO THE SIGNAL AT WHICH POINT AND ALL KEY FEATURES SHOULD BE LABELED.

**Hand written schematics are required for physically built circuits, ONLY!!!**

# Part A – Sine Waves and Hearing (14 pts)

A.1 Setting up a Sine Wave on the Function Generator/Signal Generator

1. Printed output plot of signal measured by the scope with a peak-to-peak amplitude of 400mV(Amplitude of 200mV) (TA MUST see this live on your computer screen to sign checklist) (5 pt)
2. On the plot, mark the period and amplitude and denote the calculated frequency. (1 pt)
3. Briefly comment on any differences between the Function Generator/Signal Generator settings, the Measurement window results, and the results from the oscilloscope plot (1 pt)

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A.2 Using the Audio Output from Analog Discovery or M2K

***Use text box below to answer all three questions***

1. When listening to the audio, what does the scope measure for the peak-to-peak amplitude when the speaker is producing a comfortable level of sound? (4 pt)
2. What is the period of the tone at the frequency that appears loudest when you scanned through the entire range of frequencies? Note: There is a range of acceptable answers to this question since it depends on the hearing of the person listening and the frequency response of the circuit. (3 pt)

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# Part B – Voltage Dividers and Measuring Equipment (48 points)

B.1 DC Measurements

1. Create a table of data for all four battery types. Remember that you only need to measure 2, and then collect data from other groups to complete the table. The table must have a) battery type, b) unloaded battery voltage, c) loaded battery voltage, d) the total load resistance of the test, and e) the calculated value of Rbat. Show the formula you used to calculate the value of Rbat. (20 pt) ***(You may take a picture of a handwritten table and place below or create a table in Word.)***
2. Find one reference that states the expected internal resistance of one of the batteries used. In most cases we assume you will find one using a web search. Battery company web sites might be a place to look. Give the source and the value stated. Compare it to the measured value. (4 pt)

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B.2 AC Measurements

1. Printed Analog Discovery/M2K scope plot or the plot copied to a Word doc of input and output from the 1k voltage divider. (TA MUST see this on your computer screen to sign checklist) (4 pt)
2. Printed Analog Discovery/M2K plot or the plot copied to a Word doc of input and output from the 1Meg voltage divider. (4 pt)

3. Calculate the value of RA2+. (4 pt) Show your work. (4 pt)

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B.3 Power Calculations and Impedance Matching

1. List the power out of the 9V battery and the power per resistor. Also state the power out of the AA battery pack. (4 pt)

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1. Plot the predicted power into the load vs. Rload for a 9V battery assuming the battery has an internal resistance of 30Ω. *Note: There should be a maximum power (matched impedance)* (4 pt)

# Part C – Introduction to *Capture/PSpice* (14 points)

C.1 AC Measurements

1. Printed PSpice transient plot of voltage divider with 2 1k resistors (two traces). (4 pt)
2. Printed PSpice transient plot of voltage divider with 2 1MEG resistors (two traces). (TA MUST see this on your computer screen to sign checklist) (4 pt)
3. How does the signal you generated with PSpice using the 1k voltage divider compare to the one you generated with the Analog Discovery scope? (3 pt)

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1. How does the signal you generated with PSpice using the 1Meg voltage divider compare to the one you generated with the Analog Discovery scope? (3 pt)

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**List group member *responsibilities (4 pts)*.**

List by name who was responsible to make sure that the different parts of the experiment were completed and that the results are posted in this document. The person responsible to ensure the work was completed isn’t necessarily the one who did the work.

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**Summary/Overview** (0 to -10 pts) This is for future experiment. Nothing is required for Experiment 1.

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***Experiment 1***

***Checklist w/ Signatures for Main Concepts***

INSERT SIGNED COPY OF CHECKLIST BELOW (OR ADD SCANNED PDF VERSION)



***Experiment 1***

***Hand Drawn Schematics***

INSERT HAND DRAWN SCHEMATICS FOR ALL CIRCUITS BUILT

