ISIM Lab 1- Pendulum

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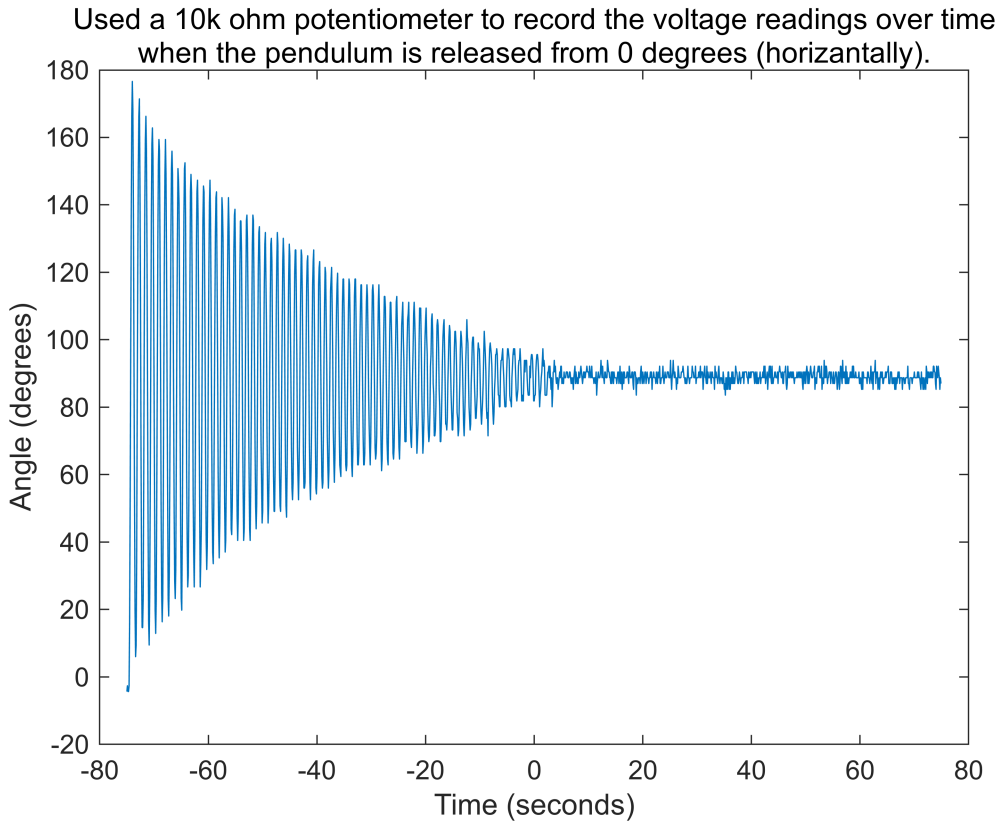
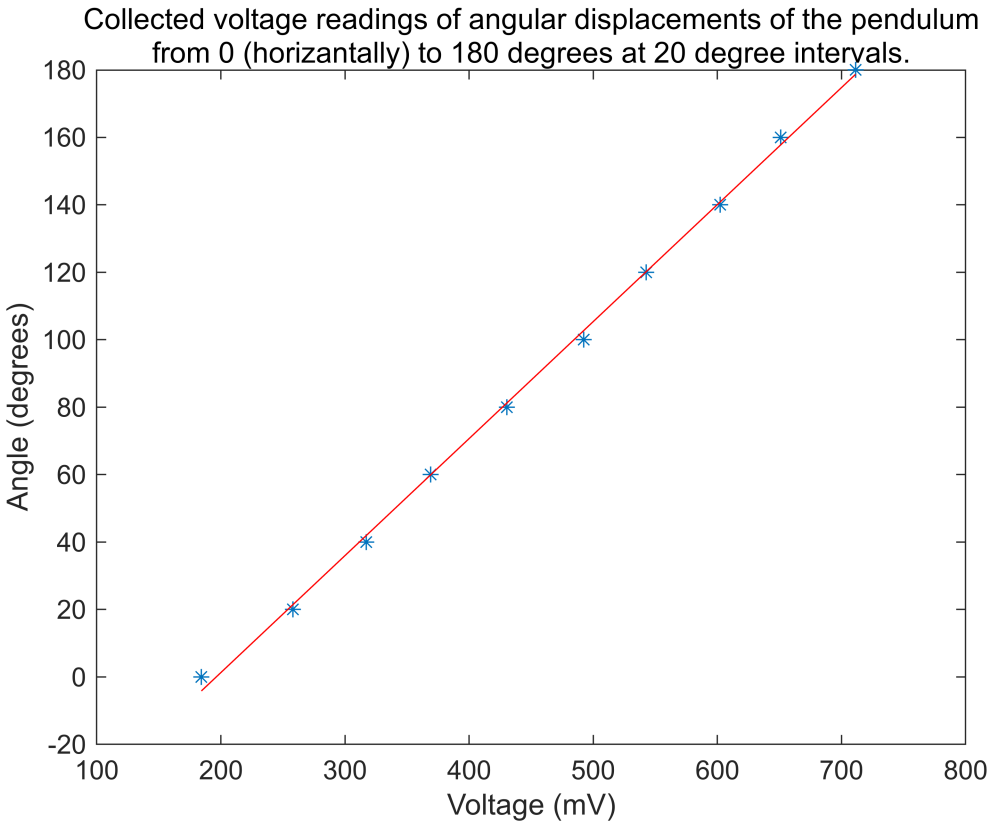
Matlab Code & Graphs

```
clear; % clears memory - useful if you run many scripts in the same session
clf;

%take in data from csv file
tname='pendulum.csv'; % <-input your data file's name! test2.csv was exported from
O-scope software with a line of headers
datatable  = readtable(tname);%makes data table with headers

%interpret data as times and voltages
time1  = datatable.t1; % stores the t1 column of data in a variable called time1
V1    = datatable.ch1; % stores the ch1 column of data in a variable called V1
time2    = datatable.t2; %stores the t2 column of data in a variable called time2
V2 = datatable.ch2; %stores the ch2 column of data in a variable called V2


%% TIME VERSUS ANGLE
figure;
theta = (V1*1000*0.347) -68.1;
plot (time1, theta)
xlabel('Time (seconds)'); % add x axis label
ylabel('Angle (degrees)'); % add y axis label
subtitle({'Used a 10k ohm potentiometer to record the voltage readings over time',
'when the pendulum is released from 0 degrees (horizantally).'})
```

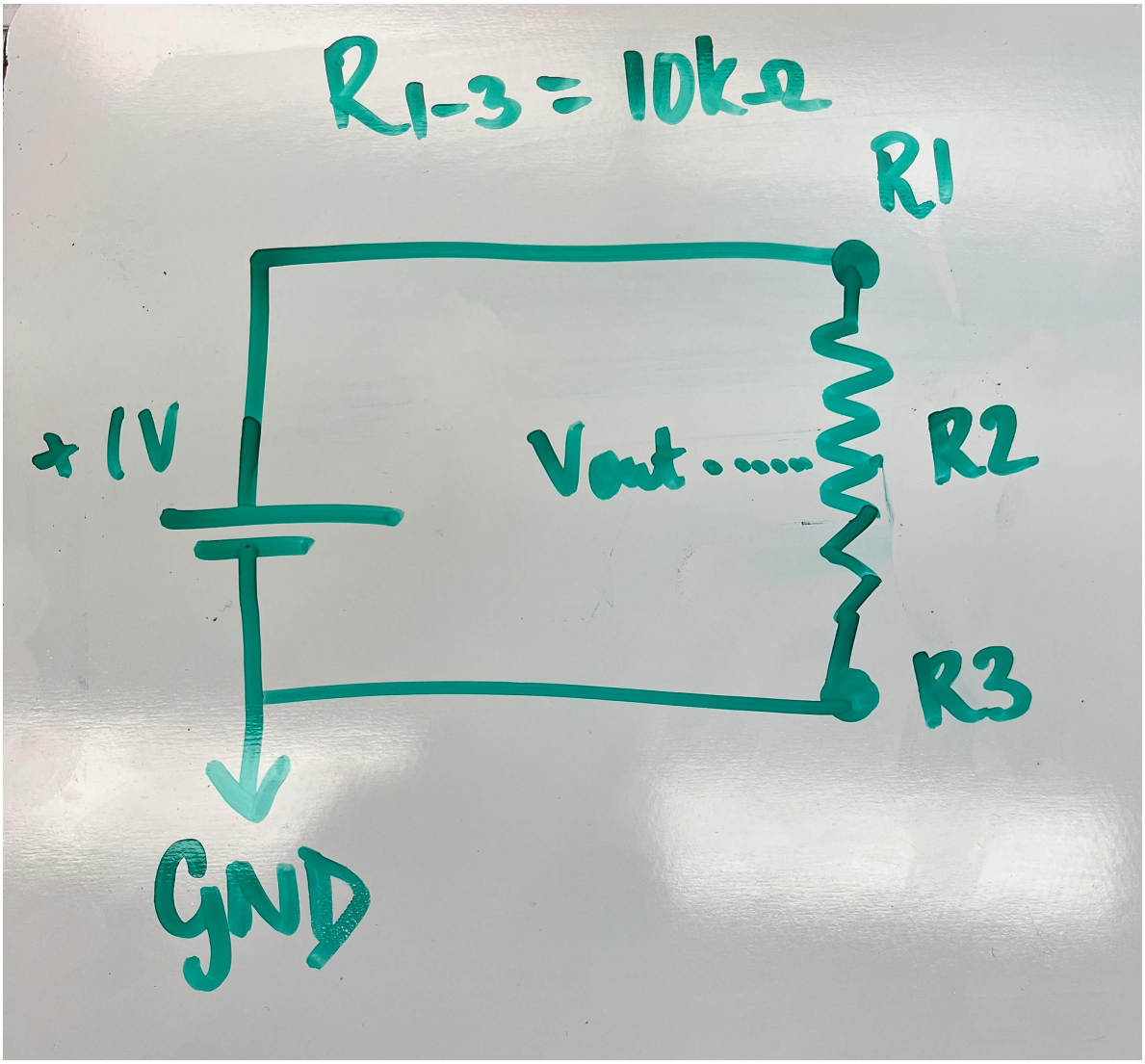



```
%% VOLTAGE VERSUS ANGLE
% 0 degrees is measured horizontally.
Angle    = [0; 20; 40; 60; 80; 100; 120; 140; 160; 180];   %% enter data by hand -
change to your numbers
Voltage  = [184.3; 258.1; 317.2; 368.9; 430.4; 492.4; 542.6; 602.3; 650.9; 711.3];
%% enter data by hand - change to your numbers

plot(Voltage, Angle,'*');  % plot data as * points
hold on;                % hold the plot so that the next one will overlay

AngleCal = (Voltage*0.347) -68.1;   %% The linear calibration curve. Numbers were
selected by hand to get a good fit
plot(Voltage, AngleCal,'r')
xlabel('Voltage (mV)')
ylabel('Angle (degrees)')
subtitle({'Collected voltage readings of angular displacements of the pendulum',
'from 0 (horizantally) to 180 degrees at 20 degree intervals.'})
```



Circuit Diagram

Resistors 1, 2, 3 make up a 10k ohm potentiometer.



Conceptual Focus:

The transfer function is in the form of y=mx + b which is representative of a linear relationship. The variables of the transfer function were x= Voltage and y= AngleCal, and based on calculations m= 0.347 and b= -68.1. Since potentiometers have a linear voltage-to-position relationship via the equation Vout = Vin * (R2 / (R1 + R2)), the transfer function is as expected because the position relates to the angular displacement of the pendulum and also matches the linearity of the experiment.