

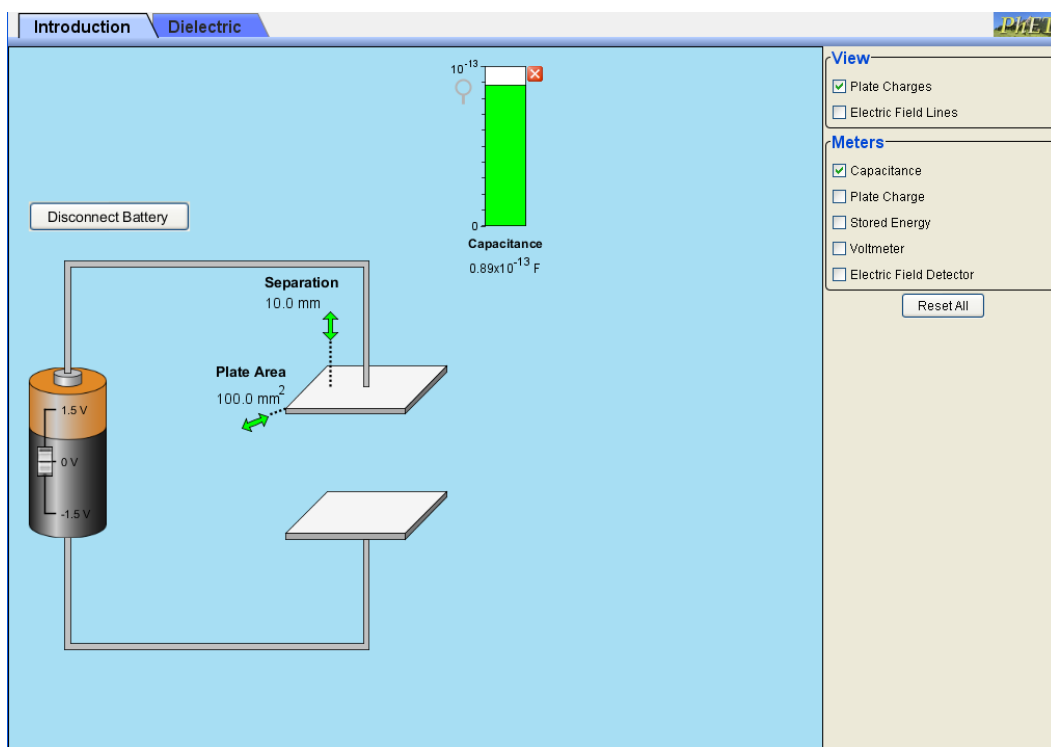
Names: _____

Date _____ Period _____

This experiment should improve your familiarity with capacitors and enable you to appreciate what happens when you change the physical characteristics of a parallel plate capacitor.

Open the following webpage, and then click on the “Run Now” button

<http://phet.colorado.edu/en/simulation/capacitor-lab>



The following window should appear.

- 1) Using the default separation and plate area, adjust the battery between -1.5 V and 1.5 V. Write down your observations.

- 2) Now connect the meter marked “Plate Charge”, and the Voltmeter You’ll need to connect the voltmeter to the plates. Repeat the first procedure, and make three measurements of Charge Q, and the corresponding voltage V.

Q /coulombs			
V/volts			
Capacitance / F			

Verify that the capacitance agrees with your measured values of Q and V. Show your working.

- 3) Now we’re going to investigate what happens when we change the dimensions of our capacitor. Firstly, disconnect all meters and the battery.

The screenshot shows the PhET Capacitance Lab simulation interface. On the left, there is a 1.5V battery with a voltmeter connected across it showing 0V. A capacitor is shown with a plate area of 100.0 mm² and a separation of 10.0 mm. A 'Plate Charge (top)' meter shows 'lots (+)' and 'lots (-)' with a 'none' indicator. A 'Capacitance' meter shows a reading of 0.89 x 10⁻¹³ F. On the right, there is a 'View' panel with checkboxes for 'Plate Charges' (checked), 'Electric Field Lines', 'Capacitance' (checked), 'Plate Charge', 'Stored Energy', 'Voltmeter', and 'Electric Field Detector'. A 'Reset All' button is located below the 'View' panel.

a) Vary the area of the plates. How does the Capacitance vary with area A ? Show your calculations below

b) Vary the separation of the plates. How does the Capacitance vary with the separation d . Show this below.

Write down an expression for the capacitance of a parallel capacitor, and calculate the constant of proportionality, ϵ_0 .

- 6) Repeat experiment 5) a) but now use the stored energy meter. Why do you think the change takes place.

Where does this energy come from / go to?

- 7) Now repeat 6, but with the battery connected.

Harder question. Do you think that mechanical work had to be done to increase the separation of the plates. If so, how do you reconcile this with the fact that the energy stored DECREASED when you increased separation.