

Name \_\_\_\_\_  
SI Physics  
Period \_\_\_\_\_

Date \_\_\_\_\_  
Lab #29 (45 pts)  
Mrs. Nadworny

Partners:  
(1 pt)

Due Date \_\_\_\_\_

## Capacitors


### Purpose

- To explore some factors (plate separation, insulating material, plate overlap) that affect the capacitance of a capacitor.

### Materials

- 2 metal plates
- 4 plastic clips
- wires
- multimeter
- textbook
- ruler

### Procedure

- Use the plastic clips to stand the plates vertically as in the picture below.
- Use wires with alligator clip ends to clip each of the capacitor's plates to the red and black leads (wires) of the multimeter.
- Turn on the multimeter and turn the dial to the 2n capacitance setting.  (Be sure you are not touching the plates when measuring the capacitance or this will affect your results.)

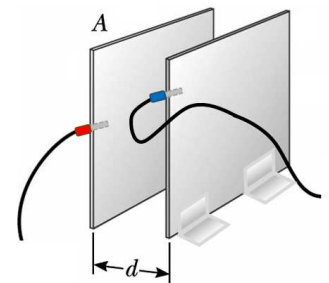
### PART 1

### Research Question

- What is the relationship between plate separation distance ( $d$ ) and capacitance ( $C$ )?

### Variables

- Independent variable (1 pt) –
- Dependent variable (1 pt) –
- Constants/Control (2 pts) –



### Procedure

Devise a method to determine how the distance between the plates ( $d$ ) affects the capacitance ( $C$ ) of the capacitor. Your method should include numerical data (no uncertainty estimates needed) as well as observations (i.e. – far & close). Show your data/observations in the space below or on a separate piece of paper stapled to this lab.

### Data Collection (6 pts)

## Data Analysis

1. Based on the analysis of your data make a **claim** that answers the research question.  
(Specify the type of relationship.) (2 pts)

2. State some **evidence** in support of your claim. (2 pts)

## PART 2

### Research Question

- What is the effect of inserting an insulating material - textbook ( $\epsilon$ ) between the plates on capacitance (C)?

### Variables

- Independent variable (1 pt) –
- Dependent variable (1 pt) –
- Constants/Control (2 pts) –

### Procedure

Devise a method to determine the effect that inserting a textbook between the plates has on the capacitance of the capacitor. Your method should include numerical data (no uncertainty estimates needed) and observations (i.e. – with textbook between & without textbook between). Show your data/observations in the space below or on a separate piece of paper stapled to this lab.

### Data Collection (4 pts)

## Data Analysis

3. Based on the analysis of your data make a **claim** that answers the research question.  
(Specify the type of relationship.) (2 pts)

4. State some **evidence** in support of your claim. (2 pts)

## PART 3

### Research Question

- What is the relationship between area of overlap of the plates (A) and capacitance (C)?

### Variables

- Independent variable (1 pt) –
- Dependent variable (1 pt) –
- Constants/Control (2 pts) –

### Procedure

Devise a method to determine the relationship between the area of overlap (A) of the plates and the capacitance of the capacitor. Your method should include numerical data (no uncertainty estimates needed) and observations (i.e. - ~100% overlap, ~75% overlap, and so on). Show your data/observations in the space below or on a separate piece of paper stapled to this lab.

### Data Collection (6 pts)

## Data Analysis

5. Based on the analysis of your data make a **claim** that answers the research question.  
(Specify the type of relationship.) (2 pts)
6. State some **evidence** in support of your claim. (2 pts)

## Conclusion

7. Express the three relationships ( $d$ ,  $\epsilon$ ,  $A$ ) explored in all three investigations in terms of a formula equating to capacitance ( $C$ ). (2 pts)