Physics Department
Electricity and Magnetism Laboratory

Lab Group		**Student Names**	**Stamp**
Session Date			
Deadline Date			

ELECTRIC FIELD AND POTENTIAL IN A PARALLEL-PLATE CAPACITATOR.

Note:

- ***Include in the tables all units and uncertainties of the measurements.***
- ***The least squares fit should be drawn in the same plot as the experimental points.***

5.1 Electric field intensity as a function of distance between plates.

d≡Distance between plates
E≡Electric field intensity (experimental value)
E_{Th}≡Electric field intensity (theoretical value, calculated from equation [6])

d	E	E_{Th}

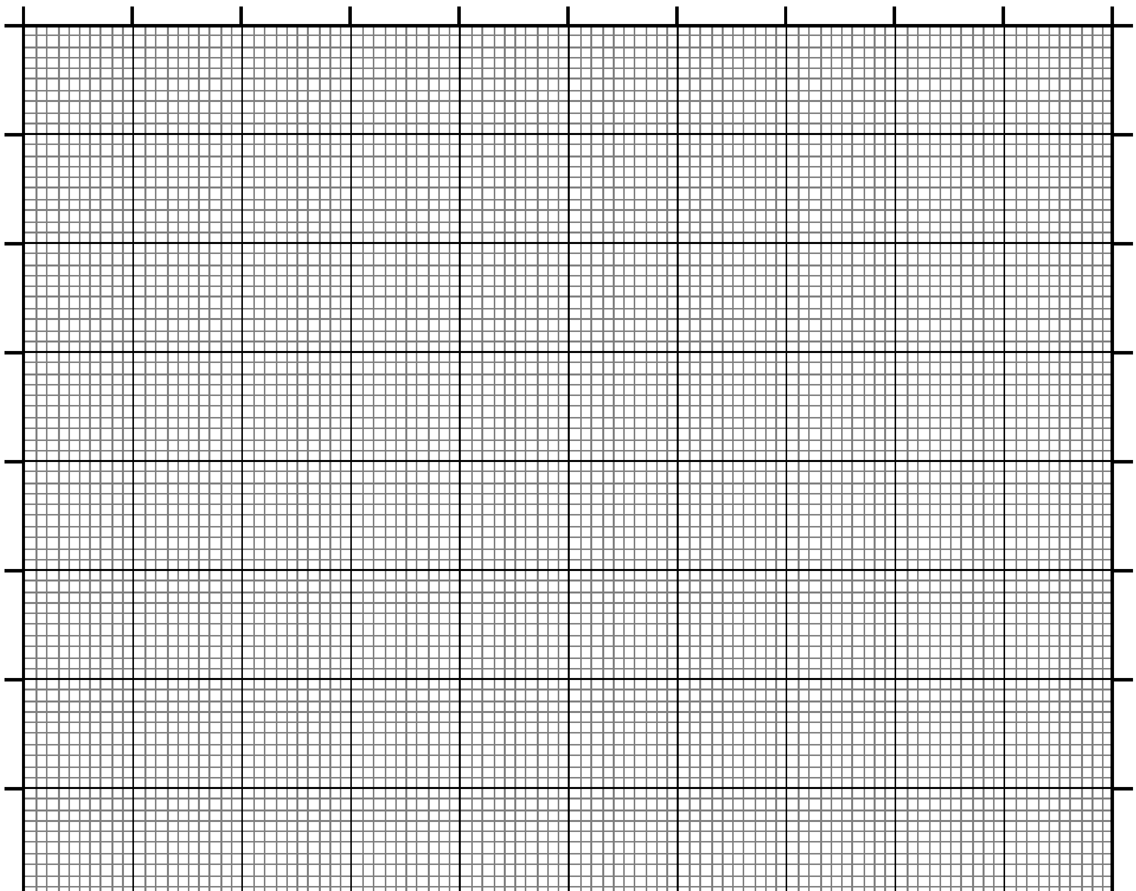
5.1.1 Plot the electric field strength (E) as a function of the distance between plates (d). Plot also the theoretical values obtained from equation [6].

5.1.2 Discuss the results of the previous graph.

5.1.3 Calculate Ln(d) and Ln(E) from section 5.1 measurements.

Ln(d)	Ln(E)

Plot Ln(*E*) vs. Ln(*d*).



5.1.4 Make a least square fit and compare the results with equation [6].

$\sum x_i =$
$\sum y_i =$
$\sum x_i y_i =$
$\sum x_i^2 =$
$n =$
$\sigma =$

- Results of the least squares fit:

  - Slope:

m =   Δm =

m =   ±   (   )

  - y-intercept:

b =   Δb =

b =   ±   (   )

What is the meaning of each fitting parameter?

5.1.5 Calculate the capacitance and the surface charge density for a plate separation of 3 cm. Develop the calculation. Do not forget to measure the area of the plates.

C =   ΔC =   ⇒ **C =   ±   (   )**

σ =   Δσ =   ⇒ **σ =   ±   (   )**

5.2 Electric field intensity as a function of applied potential difference between the capacitor plates.

E	V

5.2.1 Plot the electric field strength in terms of tension between plates.

5.2.2 Least squares fit of the points on the above plot.

$$\sum x_i =$$
$$\sum y_i =$$
$$\sum x_i y_i =$$
$$\sum x_i^2 =$$
$$n =$$
$$\sigma =$$

Results of the least squares fit:

- Slope:

m = Δm =

m = ± ( )

- y-intercept:

b = Δb =

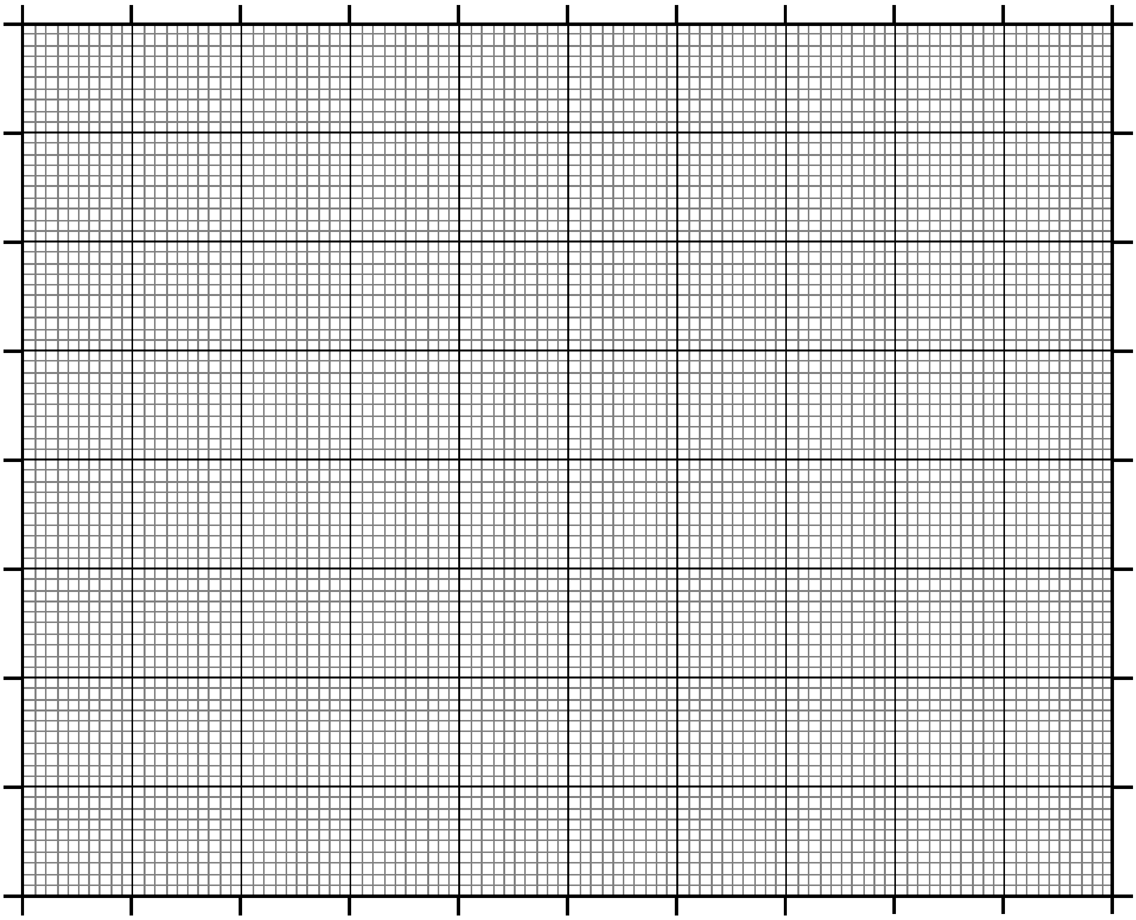
b = ± ( )

What is the meaning of each fitting parameter?

5.3 Potential inside a parallel-plate capacitor.

V	X

5.3.1 Plot the potential inside the capacitor as a function of probe position with respect to the plate connected to the positive output of the source.



5.3.2 Calculate the least squares fit of the data and compare the result with theoretical expression [7].

$\sum x_i =$

$\sum y_i =$

$\sum x_i y_i =$

$\sum x_i^2 =$

$n =$

$\sigma =$

<u>Results of the least squares fit:</u>

- Slope:

m = Δm =

m = ± ( )

- y-intercept:

b = Δb =

b = ± ( )

Compare these results with equation [7].

5.3.3 Comment the above results.
Based in your experimental results, do you think that the electric field inside the parallel-plate capacitor is approximately constant?