PHY132 – LAB 2: Capacitors – Worksheet

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| **Name:** |
| **Partners:** |
| **TA:** |

|  |  |
| --- | --- |
| **Data (40):** |  |
| **Analysis and Answering Lab Qs(40):** |  |
| **TOTAL (80):** |  |

1. **Parallel Plate Capacitor:**

**Add Screenshots**

1. A = 150 mm2 = ……….….m2; d = 5.0 mm = ……………m.

……………. (Unit); = ……………. (Unit); = …………… (Unit). 🡸 (Calculated)

……………. (pF); ……………. (Unit); …………… (Unit). 🡸 (Measured in the simulation)

Do the measured values agree with the calculated ones?

1. A’ (~doubled) = …………. m2; d = 5.0 mm = ……………m.

……………. (pF); ……………. (Unit); …………… (Unit). 🡸 (Measured in the simulation)

How do the primed values differ from the initial measured values in step a?

1. A = 150 mm2 = m2; d’ (~doubled) = ……………m.

……………. (pF); ……………. (Unit); …………… (Unit). 🡸 (Measured in the simulation)

How do the primed values differ from the initial measured values in step a?

1. A = 150 mm2 = …………. m2; d = 5.0 mm = …………m.

……………. (pF); ……………. (Unit); …………… (Unit). 🡸 (Measured in the simulation)

How do the primed values differ from the initial measured values in step a?

1. Add your comments/ a conclusion – answer questions in the manual for these parts.
2. Calculating the dielectric constant for the paper.

A = 150 mm2 = ……….….m2; d = 5.0 mm = ……………m.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | 0 | 2 | 4 | 6 | 8 | 10 | 12 |
| C (pF) |  |  |  |  |  |  |  |

P = pico = 10^-12

Slope - m = ……………….. (unit) = ……………………

(show work)

y-intercept - b = ……………….. (unit) = ……………………….

(show work)

= ………………………; % error with = ……………………….

**Screenshot of the Logger Pro plot**

**PART II. Capacitors in parallel – sharing charges**

Capacitors in Parallel:

1. Charging C1:

…………………..(Volt); = …………….. (C) ;

…………………..(Volt); = …………….. (C) ;

1. Sharing the charge stored on C1 with capacitor C2

* V1f. (measured across C1) = …………… (Volt); V2f. (measured across C2) = …………… (Volt);

Are V1f and V2f equal to each other? Why?

* = ……………(C) ; = ……….. (C)
* …………………(C). How close this value to from part a? why?
* = ………… (V). How close this value to the measured value of V1f (or V2f)?

% diff between And = ………………..%

**PART III. Finding an unknown equivalent capacitance of capacitors connected in series**

V0 = 9 Volts, C1 = 0.1 F, C2 = 0.05 F, C3 = 0.1 F, C4 = 0.2 F.

1. Charging C1:

…………………..(Volt); = …………….. (C) ;

1. Finding the unknown equivalent capacitance of C2, C3 and C4

|  |  |
| --- | --- |
| Voltage Across each capacitor  (Volt) | Charge on each capacitor Qi = Ci\* Vi.  (Coulomb) |
| V1f (for step 2) = | Q1f (for step 2) = |
| V2f = | Q2f = |
| V3f = | Q3f = |
| V4f = | Q4f = |
|  | Q234\_f = (this is a conclusion) |

What is your note about the charge on each one of the C2, C3 and C4 capacitors?

V234\_f = V2f+ V3f+ V4f = …………………. Volt. How close this value to V1f ? why?

Is the charge on each capacitor different from the others? What is Q234\_f = ………………… (unit)?

Qf\_tot = Q1f + Q234\_f = ………………………(C); How close this value to from part a? why?

Vf\_tot = V1f = V234\_f = …………………….(V); why?

=……………………….(F);

C234 = …………………………….. (use the fact that ), why?

………………………. (Use equation (4) in the manual).

……………………………………… %