University of Kentucky Department of Physics

Prelab 3

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Due 13 Sept 11:59

Problem 1

Read Lab 3.

Problem 2

(1) What is capacitance (2) What is the name for the piece of equipment that has a constant capacitance?

(1) Capacitance is the ability of a system to store an electric charge. The self-capacitiance of a conductor is

$$C = q/V$$

where q is the charge held by the conductor and V is the voltage.

(2) A device that has constant capacitance is the **Parallel plate cap**. The following shows it has constant capacitance:

$$C = \frac{\epsilon A}{d} = \frac{k\epsilon_0 A}{d} \Rightarrow C \text{ is constant for this device,}$$

where A is area, $\epsilon_0 = 8.85 \times 10^{-12}\ (F/m)$ is the permittivity of space, k the relative permittivity of a possible dielectric, d is the distance between the parallel plates.

Problem 3

What is the voltage displayed on the oscilloscope screen below? Make sure you give both the value and the uncertainty.

Volts per division for channel 1 is $\bar{V} = 2\,V$. The uncertainty is $\delta V = \left(\frac{2}{5} \cdot \frac{1}{2}\right) = \frac{1}{5} = 0.2\,V$ so

$$V = \overline{V} \pm \delta V = (2.00 \pm 0.2)V$$

.

Correction: $\delta V = (V_{max} - V_{min})/2 =$

Problem 4

The output voltage from function generator can be described by the following equation

$$V(t) = V_0 \cdot f(t) + C$$

where $V(t)$ is the actual output, $f(t)$ is determined by the type of output shape (sinusoidal, triangular, or square waveform). What is the effect of turning the frequency knob?

Turing the frequency knob has the effect of changing the scale of t.

B[T] m[A m^{-1}] (0) (1) (2)