Due Date: March 14 Aaron G. Kebede Grade 10 Physics March 10, 2022

Week of March 7 Homework

Question 1. Write down an explanation for the following concepts related to capacitance.

- 1) What is capacitance? What is the SI unit of capacitance?
- 2) How do capacitors work? Why do we use capacitors instead of batteries?
- 3) Sketch and explain how a simple parallel plate capacitor works.
- 4) Give the dimensional analysis for the SI unit of capacitance.

Question 2. Find an expression for the effective capacitance of **three** equal-capacitance capacitors connected in series.

Let's do an example of this kind when we have two equal capacitance capacitors in series,

$\frac{1}{C_T} = \frac{1}{C_1} + \frac{1}{C_2}$	Recall the effective capacitance in series
$\frac{1}{C_T} = \frac{1}{C} + \frac{1}{C}$	Since it is given that capacitance is equal for each
$\frac{1}{C_T} = \frac{2}{C}$	Adding fractions with a common denominator
Therefore, $C_T = \frac{C}{2}$	Cross multiply and find the effective capacitance



FIGURE 1. Capacitors connected in a circuit

Question 3. Figure 1 shows a circuit consisting of three capacitors. Find the effective capacitance. If the potential difference between the top and bottom ends of the circuit is 5V, find the energy stored in each capacitor.

Question 4. In a parallel plate capacitor, if the plates have an area of $20mm^2(\text{each})$, a separation of 3 mm between them and an insulator whose dielectric constant is 7.3, find the capacitance of this capacitor. Recall that $\epsilon_0 = 8.85418782 \times 10^{-12} \frac{Kg^2}{Nm^2}$

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