Capacitor Structure Capstone Questions

1. A capacitor can store 200 μC when there is a 4.0 V potential difference across the poles.
    a. Calculate the capacitance of this arrangement.
    b. Describe one potential arrangement (area and gap) that does not include a dielectric.
    c. A dielectric made of calcium ($\varkappa$ = 3.0) is inserted into the capacitor. Calculate the amount of charge stored when there is a 6.0 V potential difference across the poles.

2. A 200 μF capacitor is charged to 10.0 V. It is disconnected from the power supply and discharged through a 300 Ω resistor.
    a. Calculate the time constant for the circuit.
    b. Determine the time it would take for the capacitor to discharge to 5.0 V.
    c. Sketch the graph of potential difference across the capacitor versus time. Include the times to reach 5.0 V and 2.5 V on your graph.
    d. Describe how the graph would be different if a 150 Ω resistor replaced the 300 Ω resistor.