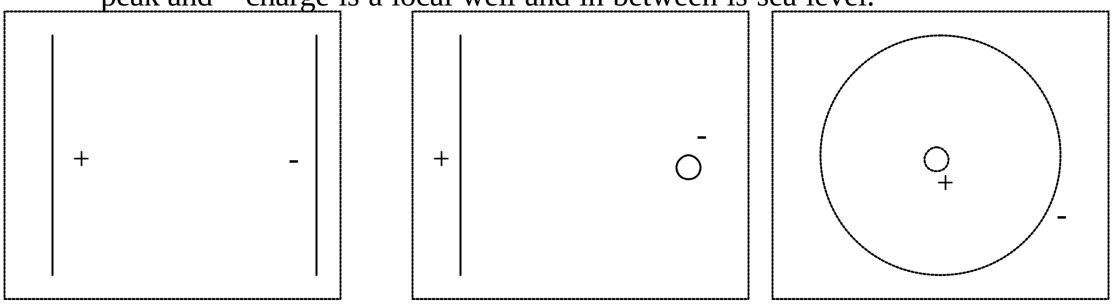
Today	**Ch 19** 3rd 1/3rd Electric Potential	**HW9Redo**, **HW11**
Monday	**Ch 20** 1st ½ DC Circuits	**HW10redo HW 12**
Lab	**4 DC Circuits**	

19.3Equipotential Surfaces and Their Relation to the Electric Field (Lab)

- **Gravitational Analog**
    - **Topal. Map**

    - **Relation between Equipotentials and E**
        - **Definition in terms of E**

- **Example 0:** Draw the elevation, and then the topal map if + charge is a local peak and – charge is a local well and in between is sea level.



- **No net electric work if a charge stays on an Equipotential**
    - **Point charge equipotentials**

Example 1: a problem like Pr. 30. In lab, many of you mapped out the equipotential lines between two parallel lines, one at –5V and the other at +5V. You saw the –4V, -3V, -2V, lines were equally spaced, indicating that the electric field was constant between the two lines. If they were 0.07 m apart, what was the field between them and in which way did it point?

19.4Capacitors and Dielectrics

- **Demo:** Charging up a capacitor.
    - **E-field of a capacitor (hollow)**

19.4.1 The Capacitance of a Capacitor

Voltage of a Capacitor (hollow

Example 2: Say we connect our two plates to a battery with 9V across its terminals, and it holds 3×10^{15} excess electrons on one plate, and they repel an equal number of electrons off the other plate. So there is a charge of 0.05 C on a plate. How much charge would it hold if it were connected to a 3V battery instead?

19.4.2 The Dielectric Constant

- **Dielectrics**
    - **Qualitative effects of a dielectric**
        - **Constant plate charge.**
        - **Constant plate voltage**

Now to get quantitative.

- **Dielectric Constant**
- **How this affects the Capacitance**

Example 3: Say I place a piece of paper (dielectric constant 3.3) between the plates of my demo capacitor, then I deposit enough charge on it that there is a 20 V difference between the plates. If I remove the paper and hold the two plates the same distance apart, what would be the new voltage?

HW12

30. Theinner and outer surfaces of a cell membrane carry a negative and positive charge, respectively. Because of these charges, a potential difference of about 0.070 V exists across the membrane. The thickness of the membrane is 8.0×10^{-9} m. What is the magnitude of the electric field in the membrane?

38. An axon is the relatively long tail-like part of a neuron, or nerve cell. The outer surface of the axon membrane (dielectric constant = 5, thickness = 1×10^{-8}m) is charged positively, and the inner portion is charged negatively. Thus, the membrane is a kind of capacitor. Assuming that an axon can be treated like a parllelplate capacitor with a plate area of 5×10^{-6} m^2, what is its capacitance?

42. Two capacitors are identical, except that one is empty and the other is filled with a dielectric ($\kappa = 4.50$). The empty capacitor is connected to a 12.0-V battery. What must be the potential difference a cross the plates of the capacitor filled with a dielectric such that it stores the same amount of electrical energy as the empty capacitor?

46. Review Conceptual Example 11 in the text before attempting this problem. An empty capacitor is connected to a 12.0-V battery and charged up. The capacitor is then disconnected from the battery, and a slab of dielectric material ($\kappa = 2.8$) is inserted between the plates. Find the amount by which the potential difference across the plates changes. Specify whether the change is an increase or a decrease.