Physics 2135 Test Preparation Homework #1, Spring 2017

These problems are intended to help you verify your level of preparation for Test 1. **They are not intended to cover every topic you could be tested on. Make sure you attend the review lecture!**

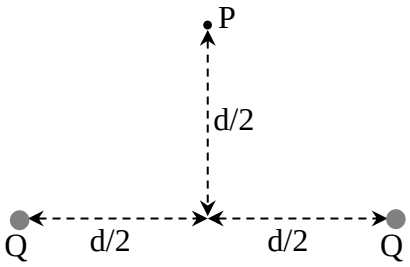
Multiple Choice (including short problems)

_____ 1. More electric field lines are found to enter a Gaussian surface than to leave it. Which of the following statements about the net charge inside the surface is true?

[A] The charge is positive. [B] There is no charge inside. [C] The charge inside is negative.

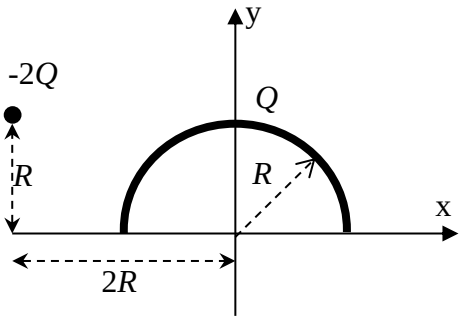
Problems

2. Two identical point charges Q = +2 μC are fixed in space a distance d=2.0 cm apart.



(a) Calculate the electric potential at the point P located a distance d/2 above the central point between the two charges.
(b) Determine the electric field vector at point P.
(c) You now bring a third point charge Q (the same charge as the other two) very slowly from infinity to point P. The original two charges remain fixed in space. How much work must you do?
(d) Calculate the force on the third charge when it is at point P.
(e) Calculate the potential energy of the configuration when the third charge is in place.

3. A semicircular thin insulating rod has a radius *R* and carries a total positive uniformly distributed charge *Q*. The center of the semicircle is at the origin. A negative point charge -2*Q* is located at coordinates (*x*,*y*) = (-2*R*,*R*). Calculate the electric potential at the origin.



4. A uniformly charged insulating sphere of radius R = 0.5 m and total charge Q = -60 μC is held centered at the origin. A point charge q = 3 μC with a mass m = 2.7×10^{-2} kg is placed on the *x*-axis a distance of 5 m from the origin. If the point charge q is released from rest, determine its speed when it is a distance of 2 m from the origin.

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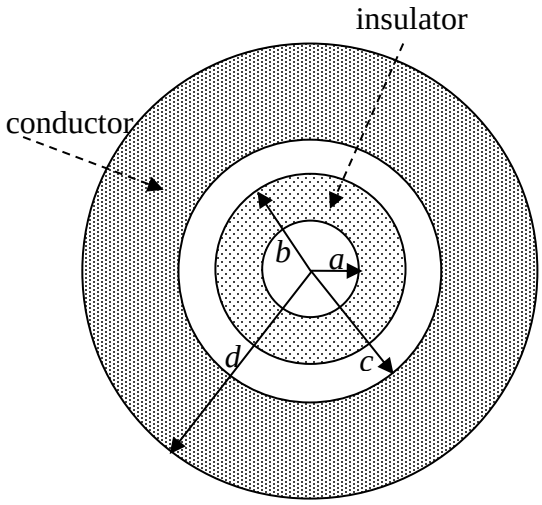
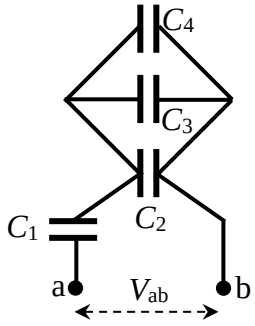
5. A solid insulating spherical shell of inner radius a and outer radius b has a uniform charge per unit volume ρ. Concentric with this spherical shell is an uncharged conducting spherical shell with inner radius c and outer radius d. The figure shows a cross section.
(a) Begin with Gauss' Law, sketch the Gaussian surfaces, and find the magnitude of the electric field in the regions $r<a$, $a<r<b$, $b<r<c$, $c<r<d$, and $r>d$. Justify all steps in your solution.
(b) Determine the charge induced on the inner and outer surfaces of the conducting spherical shell.



6. For the capacitor circuit shown, $C_1 = 4$ μF, $C_2 = 2$ μF, $C_3 = 4$ μF, and $C_4 = 6$ μF.
(a) Find the equivalent capacitance.
(b) The charge on capacitor C_4 is 6 μC. Determine the charge on the other capacitors, and the applied voltage V_{ab}.



Physics 2135 Spring 2017 Exam Rooms
February 14, March 21, April 18
5:00 – 6:00 PM

Instructor	Sections	Room
Dr. Hale	F, H	104 Physics
Dr. Kurter	B, N	125 BCH
Dr. Madison	K, M	199 Toomey
Dr. Parris	J, L	St Pat's Ballroom
Mr. Upshaw	A, C, E, G	G-3 Schrenk
Dr. Waddill	D	120 BCH
Special Accommodations		Testing Center

Know the exam time (5:00 pm to 6:00 PM)!
Find your room ahead of time!

These room assignments will be posted on the doors to 104 Physics.

BCH = Butler-Carlton Hall (Civil Engineering)
EECH = Emerson Electric Company Hall

St Pat's Ballroom is in the Havener Center, for Feb 14 exam only