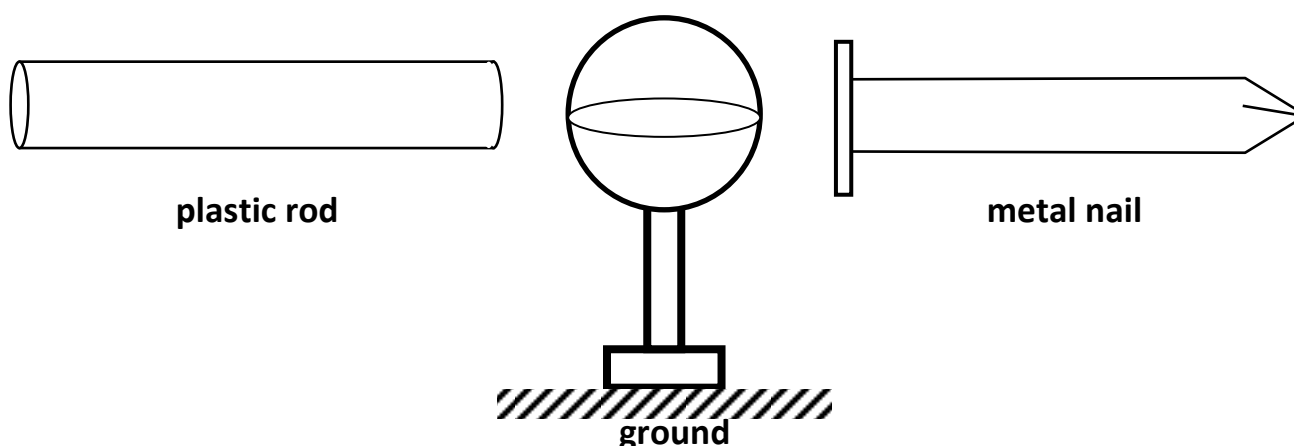


## E&M Unit I – Worksheet 2: Conductors and Insulators

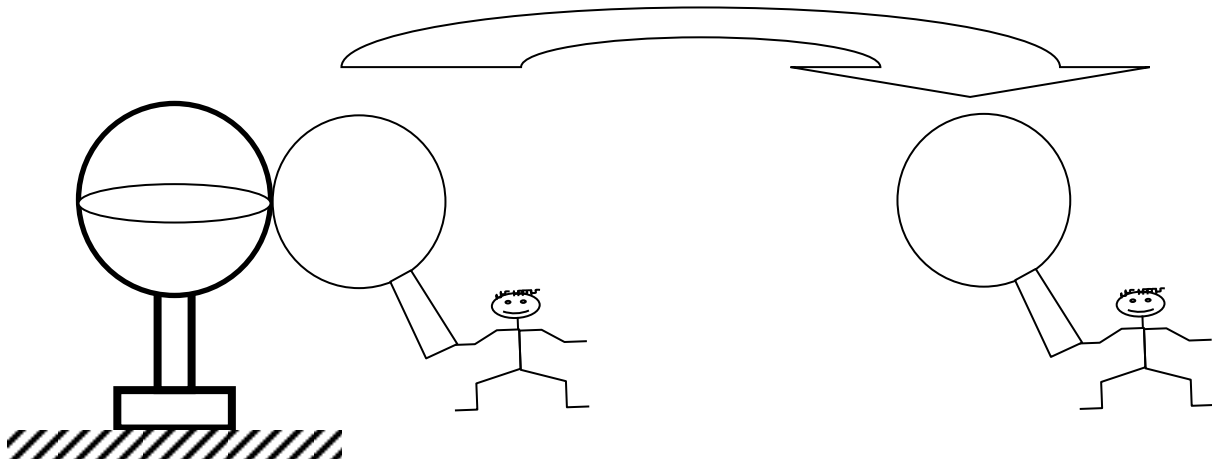
1. The drawings below represent “cross-sections” of a neutral iron nail and a neutral plastic rod, nowhere near any excess charge sources. How does the arrangement of the electrically charged particles differ in these two objects? You may use a sketch to aid your explanation.



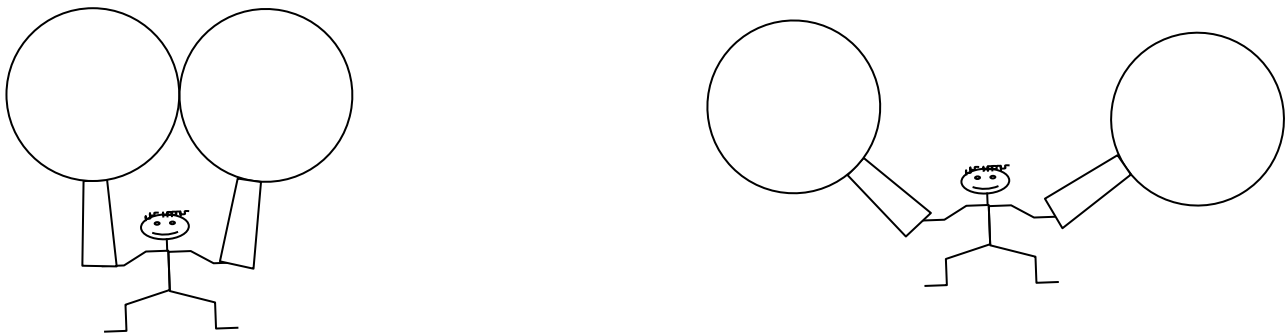
2. Now the nail and the rod are separately brought near (but NOT in contact with) a negatively charged Van de Graaff generator. For each object, explain and sketch the changes in the distribution of the charged particles.



3. A pie pan with an insulating handle is touched to a negatively charged Van de Graaff generator. Then the pie pan is removed from the area. Describe the state of charge of the pie pan as this process is performed. You may use a sketch to aid your explanation. At the end of the arrow, sketch the excess charge on the pie pan after it has been removed from the area.

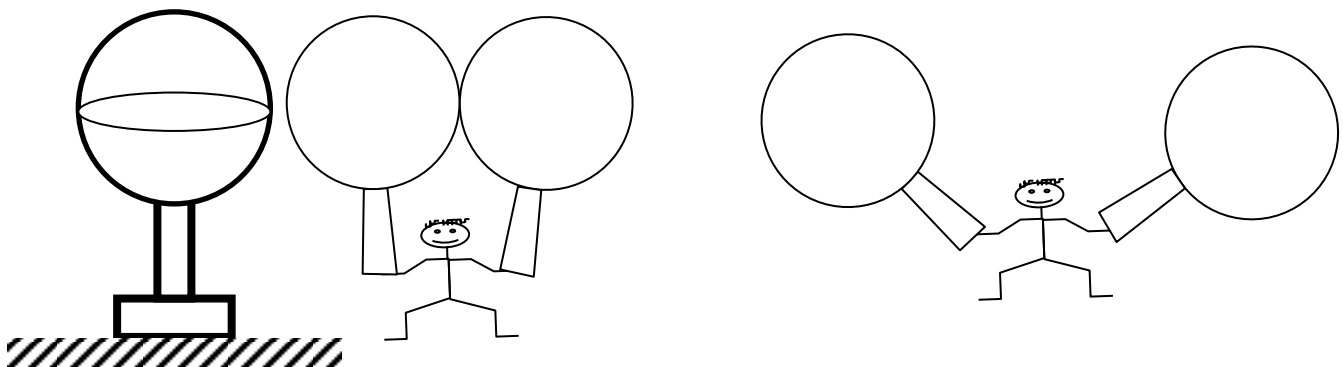


4. The charged pie pan in the previous question is now brought in contact to a previously uncharged pie pan. Describe the process and the resulting distribution of charge on the new pie pan. What percentage of the charge is transferred between pans?

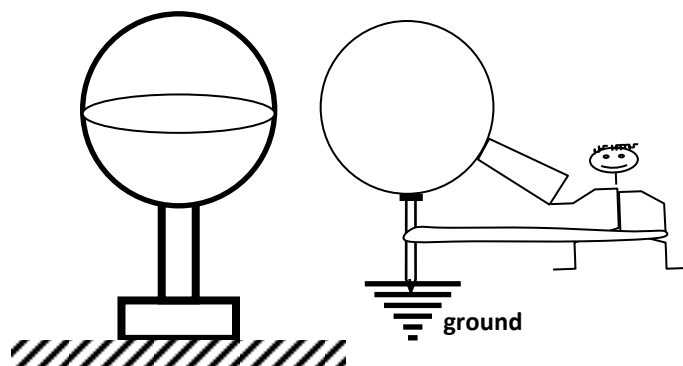
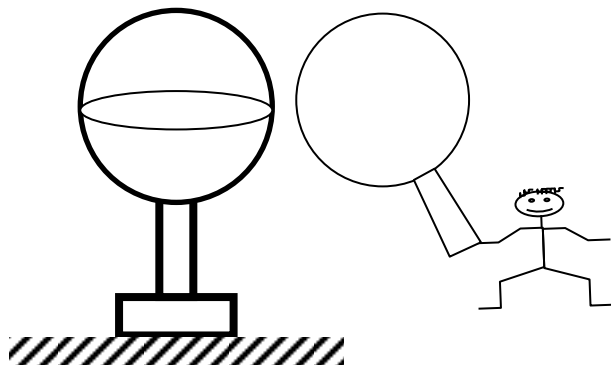


By what method did the uncharged pan gain charge? \_\_\_\_\_

5. Two pie pans touched together are brought near (but not touching) a negatively charged Van De Graaff generator. The pie pans are then separated and then removed from the area. On each pie pan, sketch in any areas of excess charge. Explain the process by which the plates are charged.



6. A pie pan is brought near (but not touching) a negatively charged Van de Graaff generator. The pie pan is grounded and then removed from the area. On each pie pan sketch any areas of excess charge.



Method by which pan is charged \_\_\_\_\_

Steps involved \_\_\_\_\_

Removed from area \_\_\_\_\_

7. Benjamin Franklin has convinced his hapless assistant Mike Piepan to participate in an experiment on electricity. Ben has set up a lightning rod, the end of which extends into his laboratory. Mike is suspended from the ceiling by an insulating rope. To one side of Mike is the end of the lightning rod, on the other side is a metal rod that is “grounded” (i.e. conducts electricity into the Earth, essentially a “charge dump”). A bolt of lightning strikes the rod, giving it an enormous quantity of excess negative charge. Assuming that no charge leaps through the air in the lab, explain, in as much detail as possible, what you think will happen to poor Mr. Piepan.

