

Date of Lab 23/02/18

Date of Submission 02/03/18

Laboratory Report

Title Electric Field Lines

Homeroom 12-I	Section 2	Name Taiga Seri
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Summary

In this lab, we ~~have~~ used the nail as a point charge, and other conductors with a different shape as a source of charge. We used the <sup>styro</sup>styrofoam rubbed with the paper for the positive charge, and the PVC rod rubbed with the fur for the negative charge. Then, we used acrylic color powder and salad oil so that we can observe the electric field lines by looking at how those powders move around the oil.

- Meet a deadline
- Write logically
- Write clearly
- Write with your own words

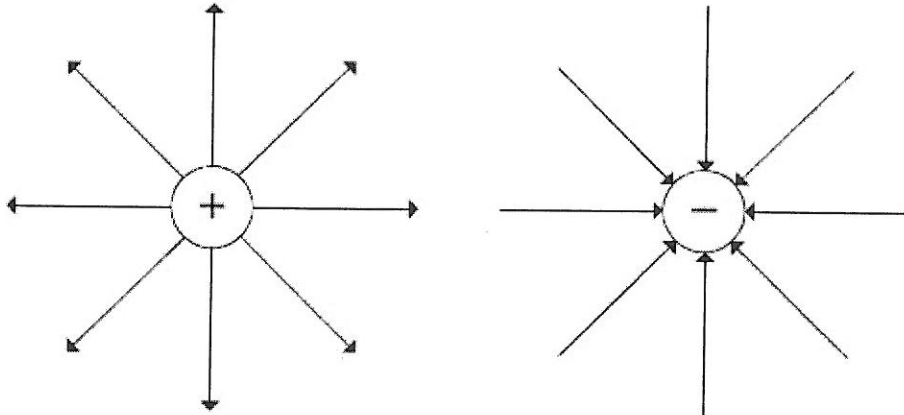
Teacher's Comments  
*Photos and sketches are both clear.*

1	2	3	4	5	6	7	8	9
Due	Summary	Intro.	Method.	Results	Table/Fig.	Discussion	Clearness	General
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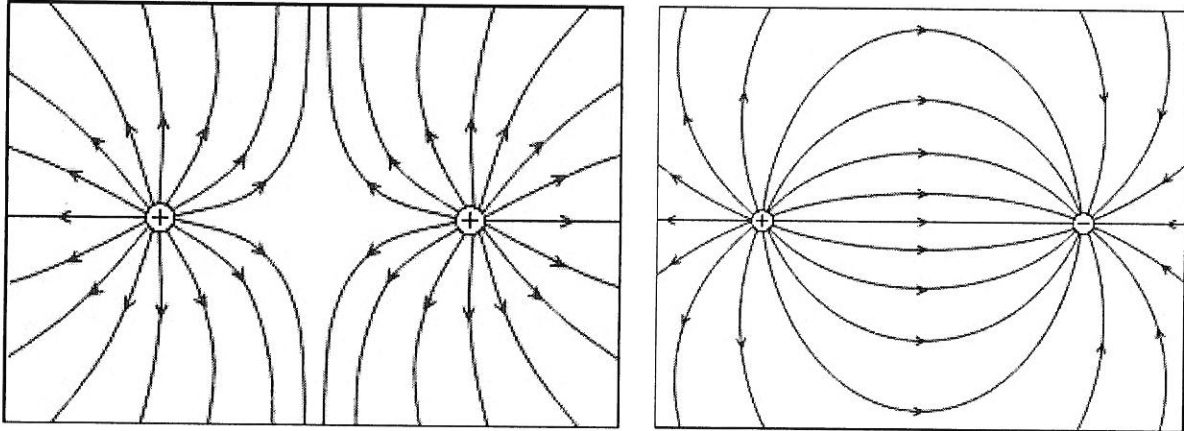
\* Use this form as a cover sheet.  
\* Submit your reports by the seventh day after your lab.

**Theory:**

When a charge is placed, and the electric force works on the charge, there is an electric field existing. In this lab, we visualize this force acting on the charge by observing the electric field lines. Electric field lines are moving from positive charges to negative charges as shown in the picture below.



In this lab, we observed electric field lines that are made by more than one point charge, and also the charge that has the shape other than the point.



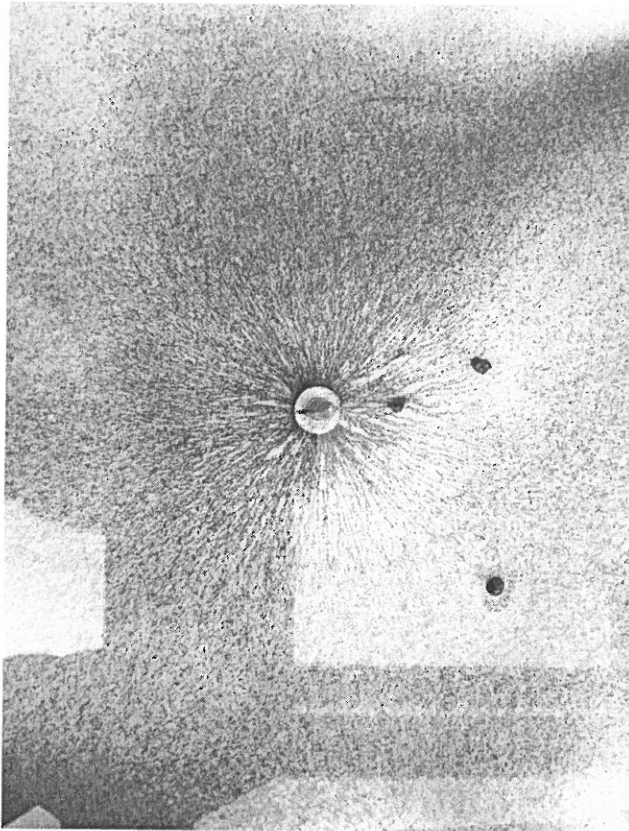
**Materials:**

- Camera or Smartphone
- Electric tray (Styrofoam covered with saran)
- Polystyrene tray
- Salad oil
- 2 Nails
- Metal sheet
- Aluminium foil
- Tweezers (chopstick)
- Roll of paper
- Acrylic color powder
- PVC rod
- Fur
- Newspaper
- Strong scissors

**Procedure:**

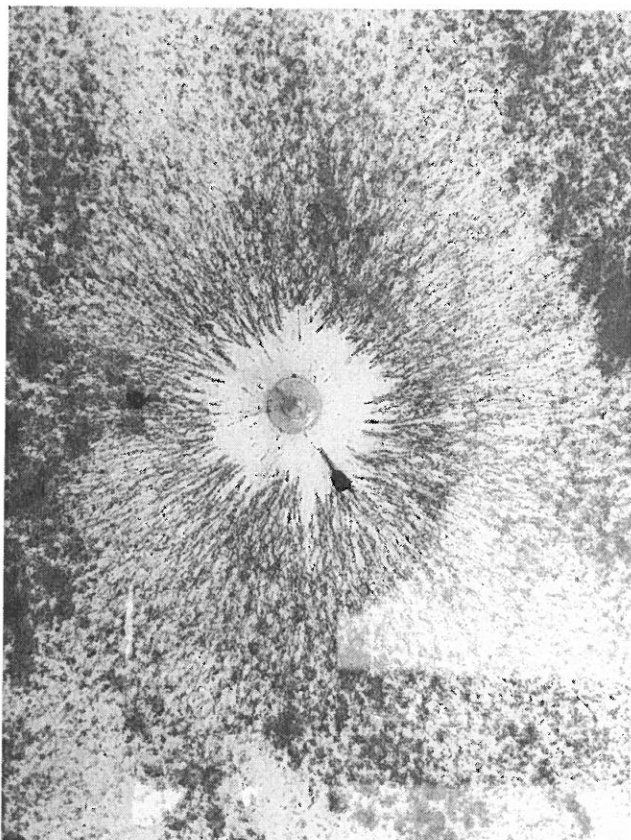
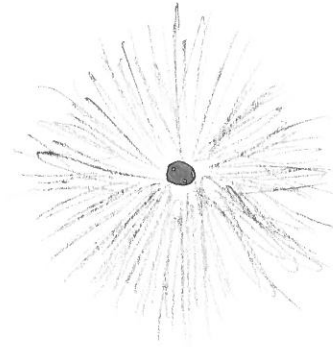
1. Gather all of the materials.
2. Spread newspaper on the desk, so that the desk won't get dirty with the oil.
3. Place a polystyrene tray on the newspaper.
4. Put salad oil into the tray.
5. Add some acrylic color powder, and spread it.
6. Place a nail in the oil.
7. Charge it with a charged materials. (PVC rod rubbed with a fur for the negative charge, and the electric tray rubbed with a paper for the positive charge)
8. Observed how the powder moves.
9. Take photos of the electric field lines.
10. Repeat #6 to #9 with one electrode (+, -), two electrodes with the same charge (+, -).
11. Cut Metal sheet into a long, thin and flat plate with each end of it fold oppositely so that the plate stands inside the polystyrene tray. (Make two of them)
12. Repeat #6 to #9 with a L-type plate and parallel plates with opposite charges.
13. Cut the part of the end of the metal plate, so that you can turn the plate into the metal ring.
14. Repeat #6 to #9 with a nail outside a metal ring and a nail inside a metal ring.
15. Clean all of the equipments.

**Results and Discussion:**



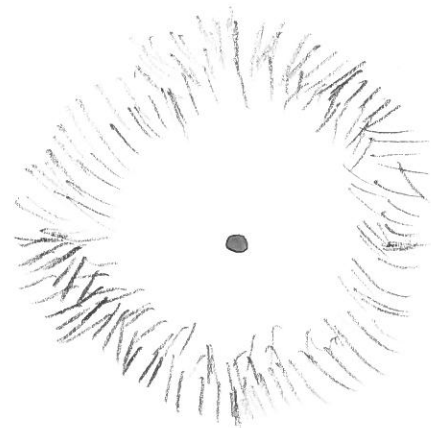
#1: One electrode (+)

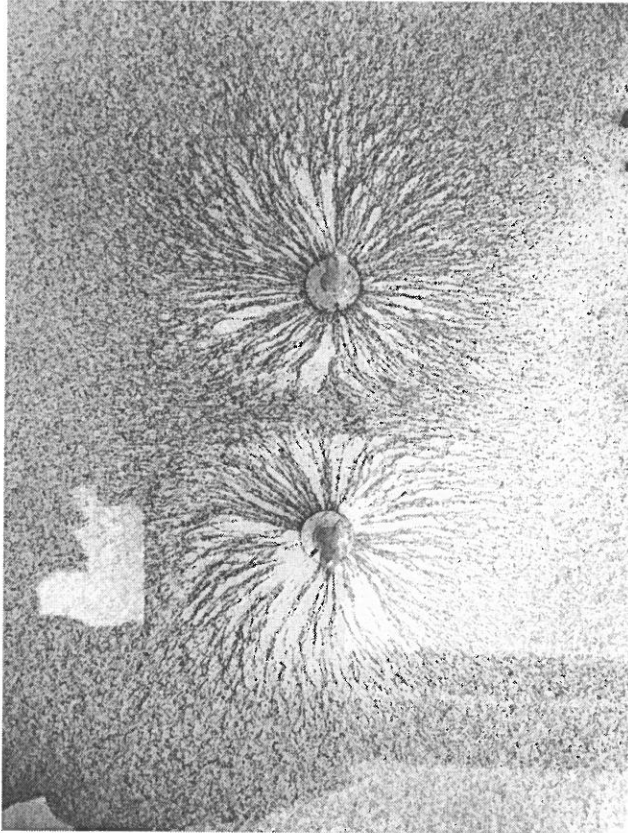
Since positively charged styrofoam was brought close to the nail, the electric field lines concentrated around the nail.



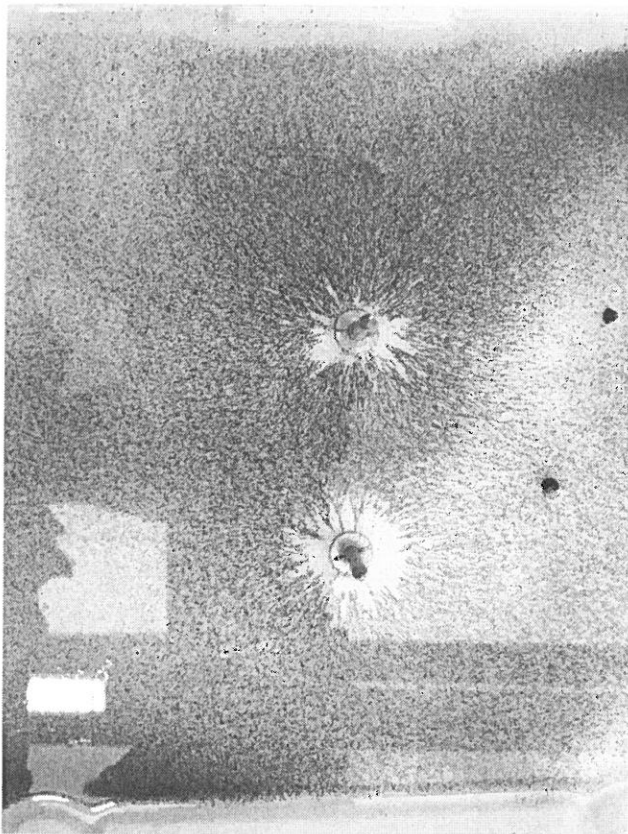
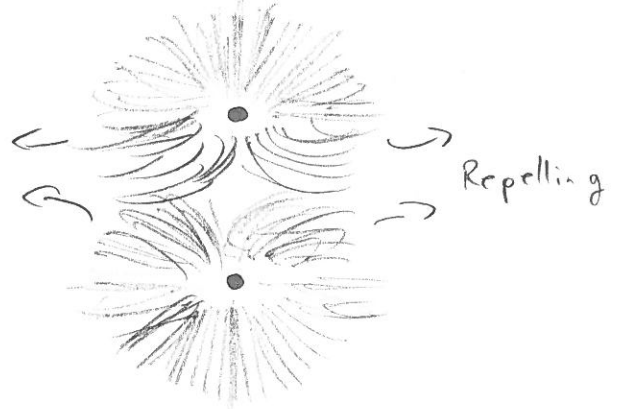
#2: One electrode (-)

Since negatively charged PVC rod was brought close to the nail, the electric field lines fade away from the nail.

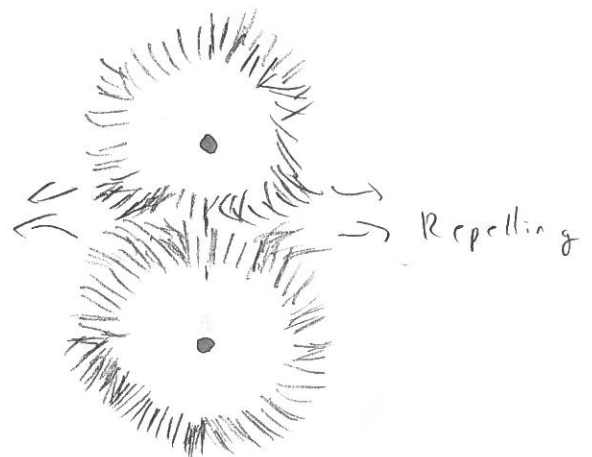


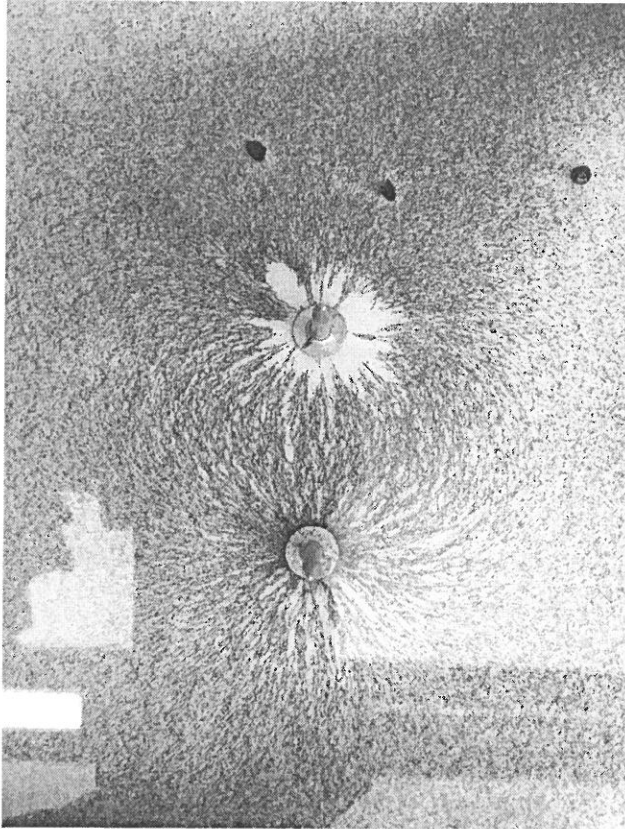


#3: Two electrodes with the same charge (+)  
Since both of the nails were charged positive, the electric field lines concentrates on both of the nails. Maybe two nails could be a little closer so that we can see two different electric field lines overlapping. In this picture, there is a part where no lines appeared between two nails, like a wall, so it is almost line two #1 done at the same time.

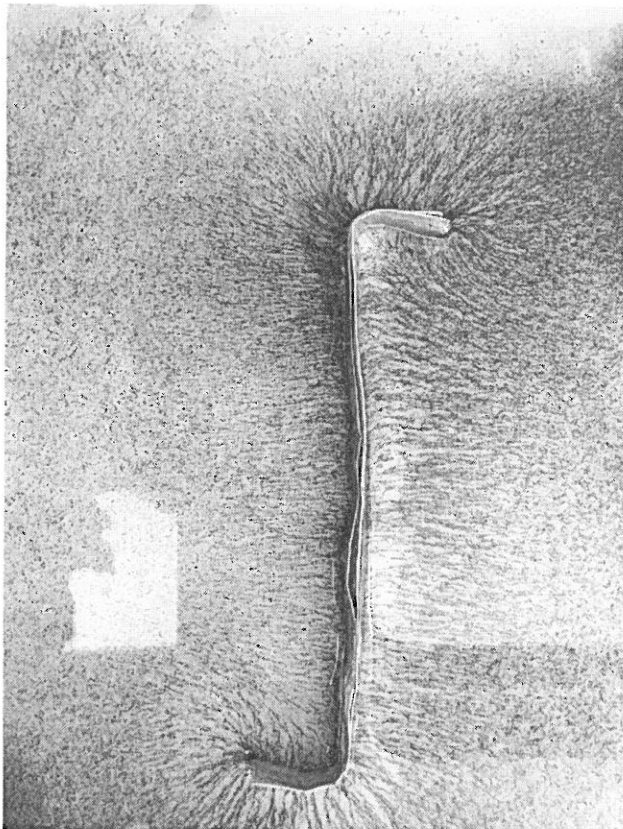
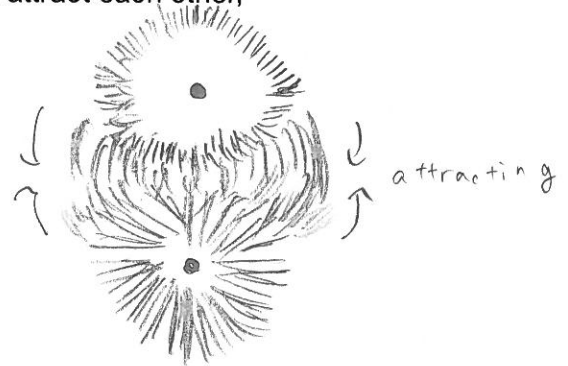


#4: Two electrodes with the same charge (-)  
Since both of the nails were charged negative, the electric field line fade away from the both of the nails, and there are no powder around the two nails. But again, the two nails were too far away that they are kind of independent.



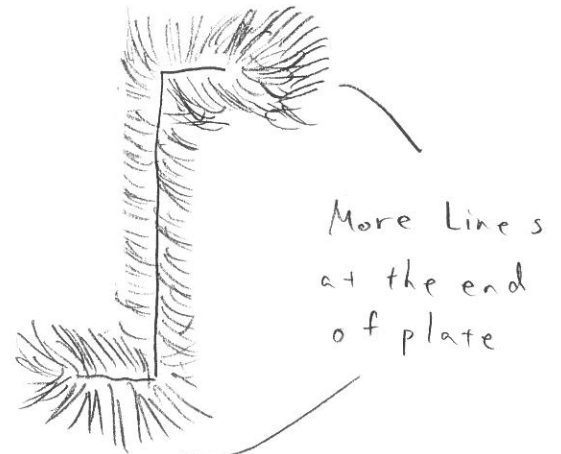


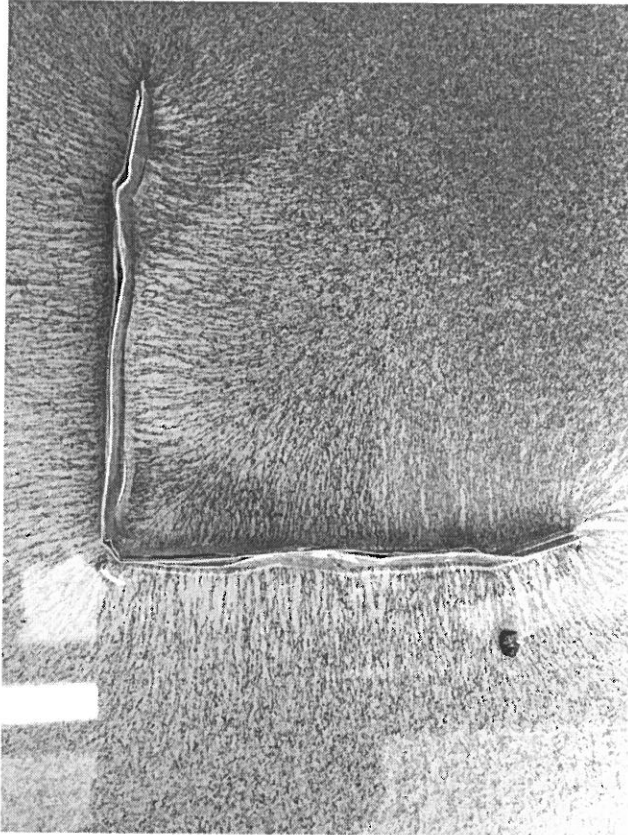
#5: Two electrodes with opposite charges. The upper nail was charged negatively and the lower nail was charged positively. The difference in the electric field lines are so obvious. The lines concentrates around the positively charged nail, but on the other hand, there are no lines observed around the negatively charged nail. Also, we can observed some kind of transition of the electric field lines between the two nails, since they are oppositely charged. Opposite charges attract each other,



#6: Plate (+)

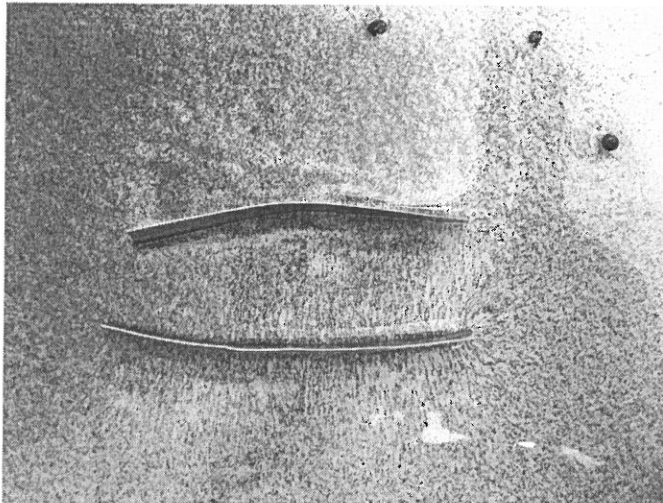
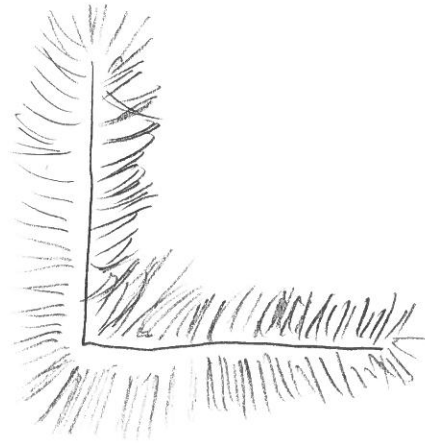
Since plate was charged positive, the electric field lines concentrated around the plate, but the lines cover the whole plate as you can see from the picture. However, there are more clear lines appearing around the both ends of plate, supposingly because the positive charges usually concentrates at the end of the charged material.





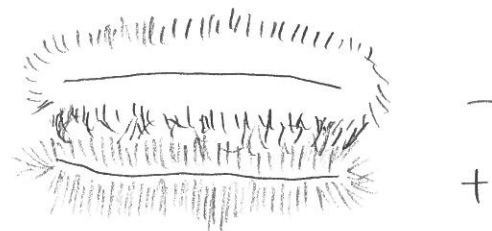
**#7: L-type Plate (+)**

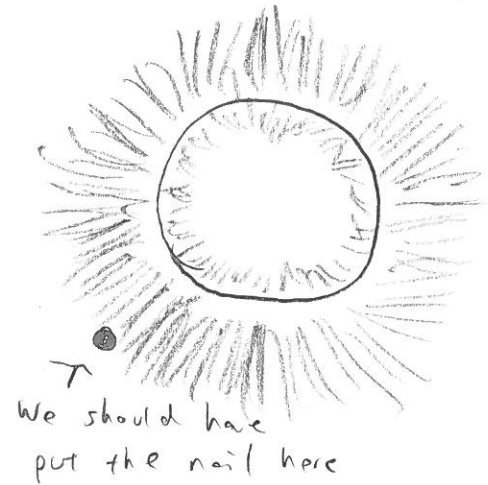
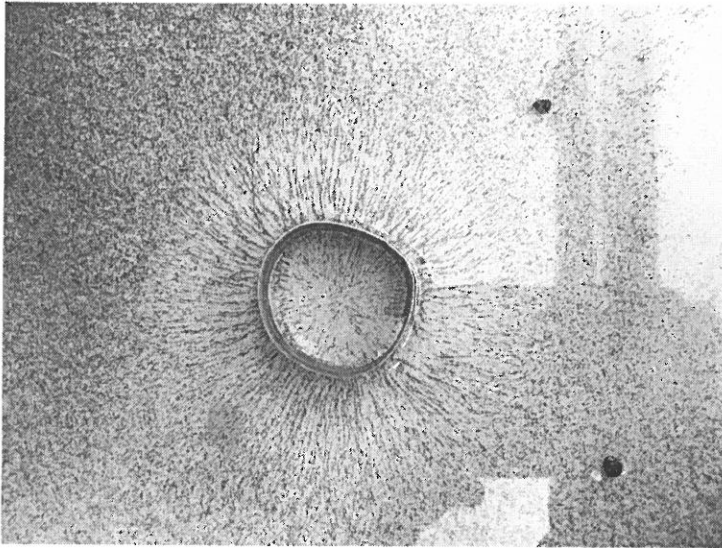
Again, the electric field lines appear around the whole material if the material is charged positive. However, unlike the plate with fold ends, this L-type plate did not show unique concentration of the lines, but they were spreaded through the plate equally.



**#8: Parallel plates with opposite charges**

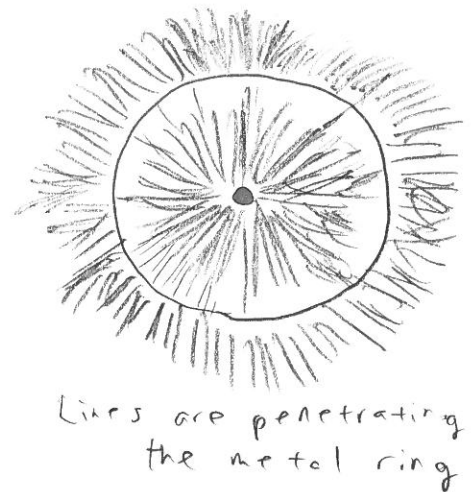
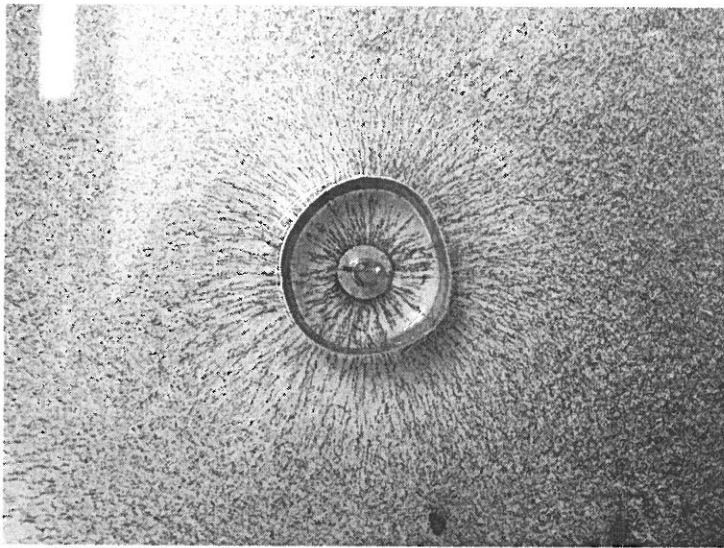
We can clearly see the electric field lines concentrating around the lower plate that is positively charged. However, we can barely notice that the upper plate is negatively charged, because there are still some powder left around the upper plate. Maybe the negative charges were not enough for the upper plate to make all of the lines fade away from it.





#### #9: Charge outside a metal ring

Actually, we should have put the nail near the metal ring, but outside of it. However, we didn't do that, so we couldn't observe what happens when the nail is charged outside the metal ring. But still, we could observe that the metal ring is clearly charged positive, because all of the lines are concentrating to the ring from both outside and inside.



#### #10: Charge inside a metal ring

When the nail was charged positively, the electric field lines concentrated around the nail. We know this from previous pictures. However, as for this time, the metal ring seemed to be ignored by the lines. As you can see from the pictures, the lines that concentrates around the nail, are spread even outside of the metal ring, so the metal ring has nothing to do with the charged nail inside it.



**Conclusion:**

After discussing about the results we got by the observation, which are the pictures listed above, we have noticed several significant things. First, some kind of electric field lines were created in all of the pictures, so the electric fields are always created if there is a charge and the conductor. Second, there is a difference between the electric field lines around the positive and negative charges, because the lines concentrated around the charged conductor for the positive charge, and the lines faded away from the conductor when the charge was negative. Third, the electric field lines are not intercepted when the nail was inside the metal ring.

