ELECTRIC FIELD AND POTENTIAL

OBJECTIVE

To draw the field lines and equipotentials of two oppositely charged conductors

EQUIPMENT

Galvanometer, two carbon-coated conducting sheets with conductor imprints, clipboard, base-mounted metal probe, metal probe with handle, 1.5-volt battery, four patch cords

THEORY

A few well known facts:

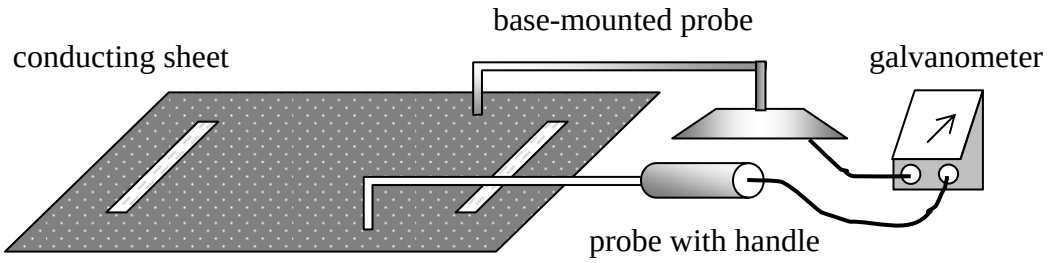
- Electric field lines point from positive charges toward negative charges.
- Charged conductors in electrostatic equilibrium have electric fields directed perpendicular to their surfaces.
- *Equipotential lines* are everywhere perpendicular to electric field lines.
- Galvanometers deflect away from zero whenever a potential difference exists between its posts. (Of course, there is no deflection whenever the posts are connected to any two points along the same equipotential.)

In this experiment, electric current flows along lines of electric field in the conducting sheets.

PROCEDURE

Follow these steps for each conducting sheet:

1) Attach a conducting sheet onto the clipboard.
2) Run a patch cord from each terminal of the battery to a post on the clipboard. The post connected to the red terminal is positive.
3) Draw the conductor configuration on your grid paper. Indicate the positive and negative conductors.
4) Run a patch cord between each metal probe and a post on the galvanometer.
5) Place the tip of the base-mounted probe at a point on the sheet at least 1 cm from one of the conductors. Locate 5 points that lie along the *equipotential line*, that is, move the probe with handle to 5 other positions where the galvanometer reads zero. (Note: Avoid contact with the white dots – they do not conduct!)



6) Draw the equipotential line that you have discovered on your grid paper.
7) Move the base-mounted probe to a new position and repeat Steps 5 and 6 for at least 5 equipotential lines.
8) Once you have drawn 5 equipotentials, sketch at least 5 electric field lines. Remember that they must be perpendicular to your equipotentials and to your conductor surfaces. Place arrows along these field lines to indicate their direction.

ASSIGNMENT: due by the end of the lab period
Each student is required to submit two field/equipotential drawings on grid paper and answers to the questions on the next page.

Name _____ **Date** _____

Partners _____

_____

QUESTIONS

1) What can you say about the potential difference between any two points along the surface of a charged conductor in electrostatic equilibrium? Explain your answer.

2) The electric field is zero everywhere inside a charged conductor in electrostatic equilibrium. Can you infer that the potential is everywhere zero (Yes/No)? Explain your answer.

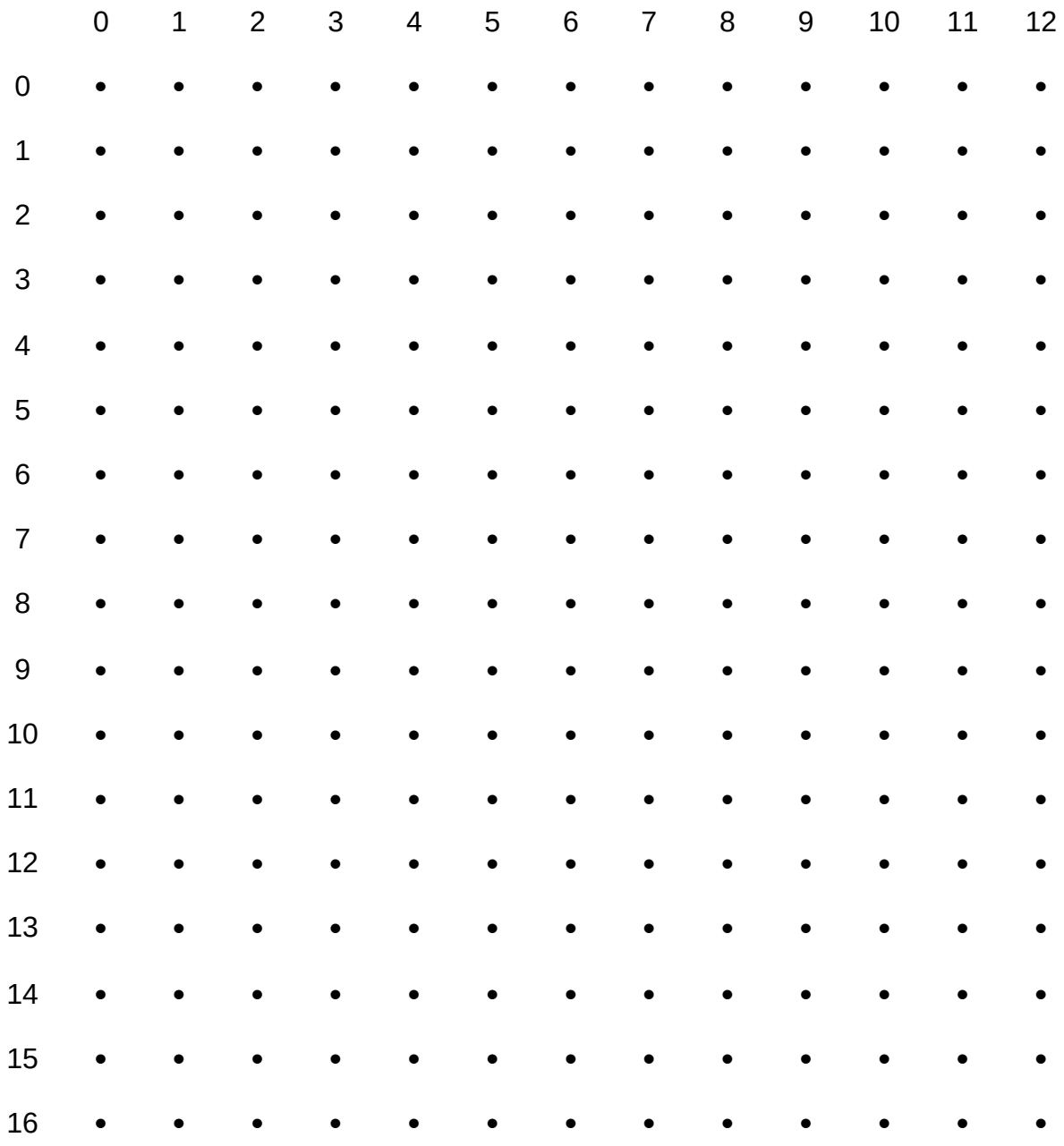
3) If you probe the equipotentials near the edges of the conducting sheets (not the conductors imprinted on the sheet), you will find that they are approximately perpendicular. Why? What does this tell you about the electric field (current) close to the edges?

Name _____ **Date** _____

Partners _____

_____

E FIELD & POTENTIAL SET-UP #1



E FIELD & POTENTIAL SET-UP #2

	0	1	2	3	4	5	6	7	8	9	10	11	12
0	•	•	•	•	•	•	•	•	•	•	•	•	•
1	•	•	•	•	•	•	•	•	•	•	•	•	•
2	•	•	•	•	•	•	•	•	•	•	•	•	•
3	•	•	•	•	•	•	•	•	•	•	•	•	•
4	•	•	•	•	•	•	•	•	•	•	•	•	•
5	•	•	•	•	•	•	•	•	•	•	•	•	•
6	•	•	•	•	•	•	•	•	•	•	•	•	•
7	•	•	•	•	•	•	•	•	•	•	•	•	•
8	•	•	•	•	•	•	•	•	•	•	•	•	•
9	•	•	•	•	•	•	•	•	•	•	•	•	•
10	•	•	•	•	•	•	•	•	•	•	•	•	•
11	•	•	•	•	•	•	•	•	•	•	•	•	•
12	•	•	•	•	•	•	•	•	•	•	•	•	•
13	•	•	•	•	•	•	•	•	•	•	•	•	•
14	•	•	•	•	•	•	•	•	•	•	•	•	•
15	•	•	•	•	•	•	•	•	•	•	•	•	•
16	•	•	•	•	•	•	•	•	•	•	•	•	•