Electric Field Vectors

Unit: Electric Force, Field & Potential

NGSS Standards/MA Curriculum Frameworks (2016): N/A

AP® Physics 2 Learning Objectives/Essential Knowledge (2024): 10.5.B, 10.5.B. 1, 10.5.B.2, 10.5.B.2.i, 10.5.B.2.ii, 10.5.B.2.iii, 10.5.B.2.iv

Mastery Objective(s): (Students will be able to…)

- Sketch & interpret electric field vector diagrams.

Success Criteria:

- Sketches show arrows pointing from positive charges toward negative charges.
- Electric field vectors show longer arrows where charges are larger and shorter arrows where charges are smaller.

Language Objectives:

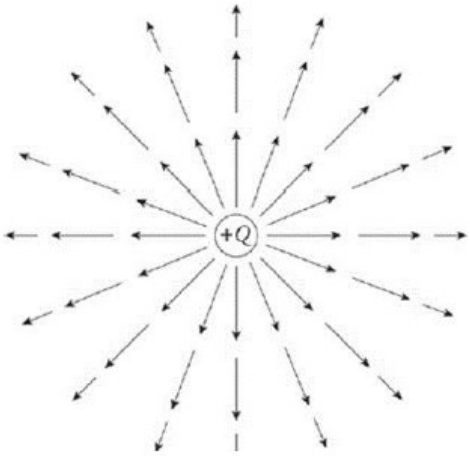
- Explain how the electric force on a charged particle changes as you get closer to or farther away from another charged object.

Tier 2 Vocabulary: charge, field

Notes:

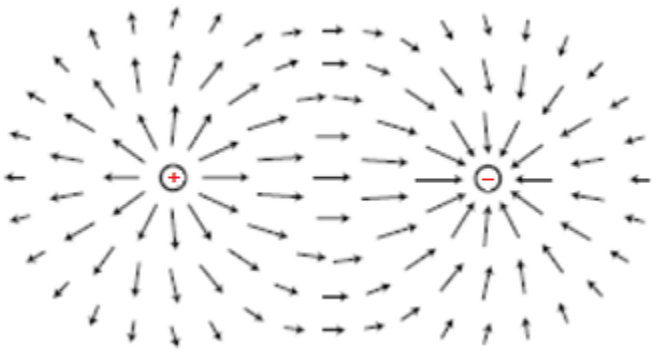
electric field vector: an arrow representing the strength and direction of an electric field at a point represented on a map.

A map of an electric field can be drawn using field vectors instead of field lines. Electric field vectors are preferred, because in addition to showing the direction of the electric field at a given location, they also show the relative strength. For example, this diagram shows the electric field around a positive charge. Notice that:

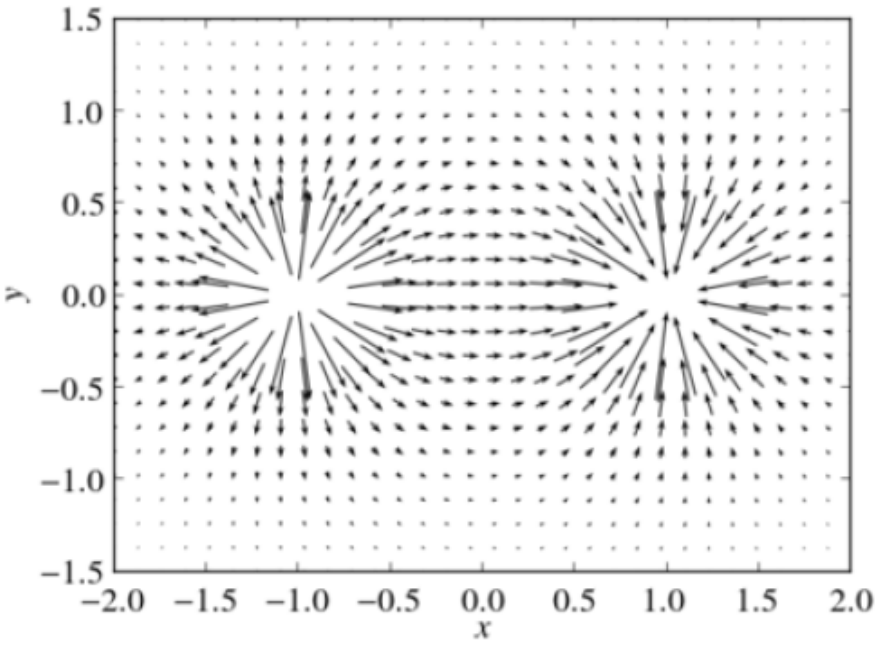


- The vectors point in the direction of the electric field (from positive to negative).
- The vectors are longer where the electric field is stronger and shorter where the electric field is weaker.

The electric field vectors around a pair of point charges, one positive and one negative, would look like the following:



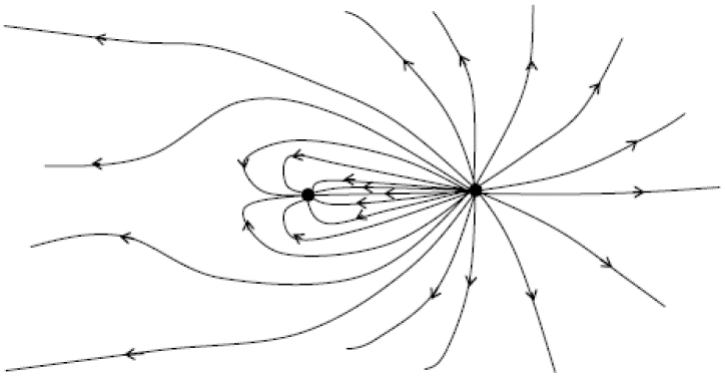
If the point charges were not shown, you could use a field vector diagram to determine their locations:



In the above example, there must be a positive point charge at coördinates (−1.0, 0) and a negative point charge at coördinates (+1.0, 0)

Homework Problems

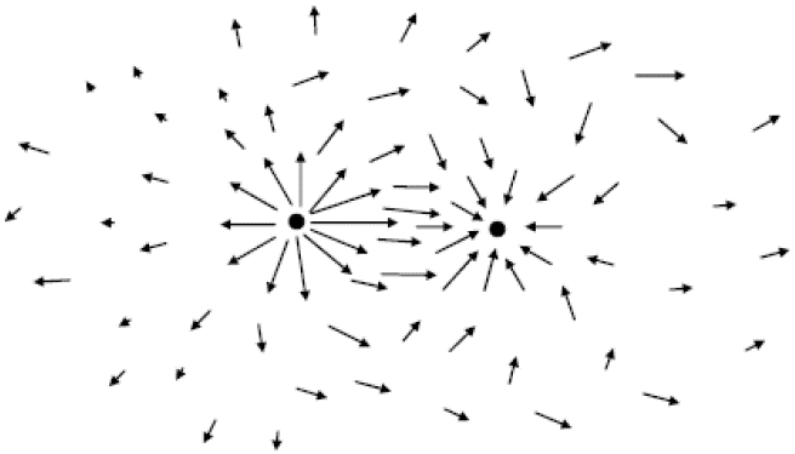
1. **(M)** In the following electric field diagram: (Note that this is not an electric field vector diagram.)



   a. Label the point charges (the black dots) with the sign of their respective charges (positive or negative).

   b. Which of the two charges is stronger? Explain how you can tell.

2. **(M)** Consider the following electric field vector diagram:



   a. Label the point charges (the black dots) with the sign of their respective charges (positive or negative).

   b. Which of the two charges is stronger? Explain how you can tell.