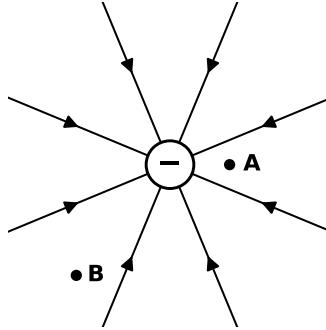


**Part A: Field Lines and Energy**

Use the field line rules from the lesson notes. Explain your reasoning.

1. The diagram shows the electric field lines around a single charge.



- Is the charge positive or negative? How can you tell?
 - Is the field stronger at point A or point B? How can you tell from the lines?
 - Which way would a small positive test charge at A be pushed? Which way would an electron at A be pushed?
2. Sketch at least 8 field lines with arrows for each pair of charges. In Pair 2, mark the point where the electric field is zero with an X.

Pair 1**Pair 2**

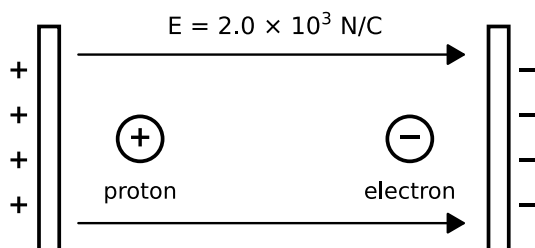
3. Jamal holds a positive charge and a negative charge close together, then slowly pulls them apart. Does the energy stored in the field go up or down? Then he lets go. What happens to the charges, and what happens to the stored energy?

Part B: Field Strength and Force

Use $E = F/q$ or $F = qE$. Give each answer with units and a direction. Show knowns, equation, substitution, and answer.

4. A $+4.0 \times 10^{-6}$ C test charge placed near a charged dome feels a force of 0.20 N north.
- What is the electric field at that point?
 - The test charge is removed and a -2.0×10^{-6} C charge is placed at the same point. What force does it feel?

5. A proton and an electron are between two charged plates. The size of the charge on each particle is 1.6×10^{-19} C.



- Find the size of the electric force on the proton.
 - Draw an arrow on each particle to show the direction of the force on it. Compare the size of the force on the electron to the force on the proton.
6. A small charged bead sits in an electric field of 6.0×10^3 N/C that points down. The bead feels an electric force of 0.024 N that points up. What is the charge on the bead, including its sign?