Guided Exploration: AR Model of a Positive Charge

Group ID:		Date:
Student Name		
Members present		

Objective

To explore electric field lines and equipotential surfaces using an Augmented Reality (AR) positive charge model.

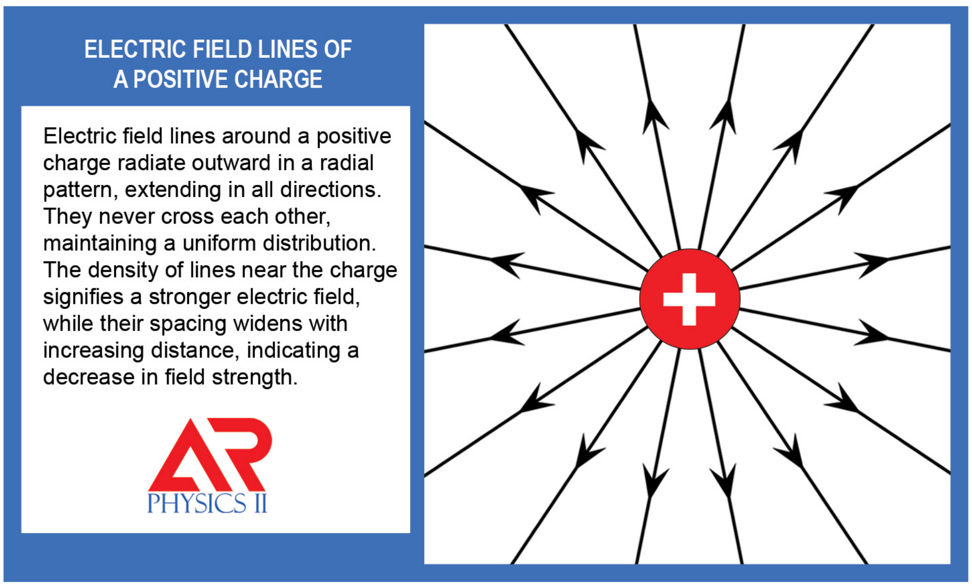
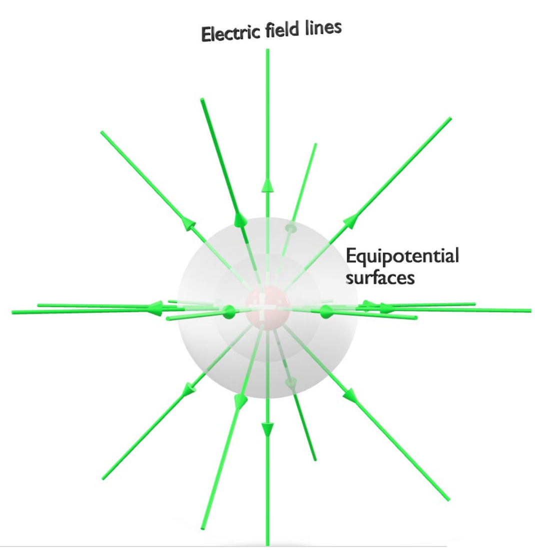


Figure 1: AR Marker for the positive charge AR 3D model

Part A: Getting Started with the AR Positive Charge



1. Launching the Model
   - Open the AR app.
   - Scan the above marker
   - Move around to view the model from multiple angles.

2. What you should see
   - Electric field lines emerging from the + charge and arrow heads pointing radially outwards
   - Equipotential surfaces surrounding the charge.

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Part B: Guided Exploration and discussions

3. Properties of the Electric Field Lines and the equipotential surfaces

- ☐ Rotate around the charge and observe the charge from different angles
- ☐ Compare the density of lines near the + charge and far away from the charge. What does this indicate about the Electric field strength?

- ☐ Are the field lines perpendicular to the equipotential surfaces? (Yes/No)
  - ☐ Are equipotential surfaces closer near charge? (YES / NO) What does the spacing indicate about the magnitude of the potential?

Think Pair Share

Imagine you are a tiny positive test charge placed near a single positive charge. What do you think will happen the moment you are released, and in which direction might you begin to move? Now picture that you are holding a small arrow that represents the electric field vector at your exact location—where is this arrow pointing at the start? As you move farther away, how does the length of the arrow change? Does it grow, shrink, or stay the same, and what might that suggest about the electric field? As you continue traveling outward, you cross different equipotential surfaces—are these surfaces getting closer together or farther apart as you move, and what might that tell you? Describe your journey to a friend: how would you explain your motion along the field line, and what did the arrow reveal about how the electric field changes as you move?

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Part C: Applying Knowledge (Near & Far Transfer)

1. The direction of electric field lines around a single positive charge is:
    a) Toward the charge
    b) Away from the charge
    c) Circular around the charge
    d) Random

2. The electric field vector at any point near a positive charge points:
    a) Toward the charge
    b) Away from the charge
    c) Along equipotential surfaces
    d) Opposite to motion

3. As the distance from a positive charge increases, the strength of the electric field
    a) Increases
    b) Decreases
    c) Remains constant
    d) Becomes negative

4. If two points are on the same equipotential surface near a positive charge, which statement is true?
    a) The electric field is zero at both points
    b) The electric potential is the same at both points
    c) The electric field direction is the same as the surface
    d) Work must be done to move between them

5. At any point where an equipotential surface and an electric field line meet, the angle between them is:
    a) 0°
    b) 45°
    c) 90°
    d) 180°