CONCEPT: WORK DUE TO ELECTRIC FORCE
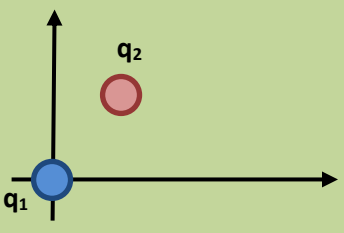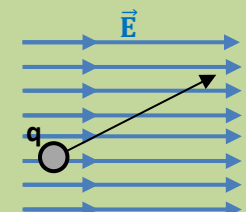
● Whenever a charge moves, it changes its position → so its **[POTENTIAL | KINETIC]** energy changes.

   - The Electric Force and/or Field accelerates and **moves** charges.

   - Remember: whenever there's a change in energy, some _____ is done.

● Energy conservation: $-\Delta U = \Delta K$

   - Work energy theorem: $W = \Delta K$

              → $W =$ _____

   - U & V relationship: $\Delta U = q\Delta V$

              → $W =$ _____   → $W =$ _____ $W =$ _____

q_2

q_1

$\vec{E}$

q

● Work by the electric force depends ONLY on _____ , NOT the "path".

   - When charges get "very far away" (infinitely far), Electric Potential Energy → _____.

EXAMPLE: A 2nC charge is initially 5mm away from a 10nC charge. The 2nC charge is then moved 2mm closer to the 10nC charge. What is the work done by the electric force?

EXAMPLE: A 1μC charge is placed in a horizontal, uniform electric field of magnitude 1,000 N/C. a) What is the work done on the charge when it travels a distance of 2m at an angle of 30° below the horizontal? b) If this 3g charge initially starts from rest, how fast is this charge going after the 2m displacement?

PRACTICE: WORK DUE TO POTENTIAL DIFFERENCE

An electron moves from point A to point B. The potential difference between these two points is 100 V. What is
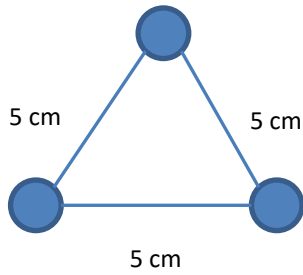
      (a) the point of higher potential?

      (b) the work done on the electron?

      (c) the final speed of the electron if its initial speed is zero?

EXAMPLE: BRINGING TWO CHARGES FROM INFINITY

How much work is done by the electric force in bringing a 5C charge from infinitely far away to the origin of a coordinate system, and then bringing a -2C charge from infinitely far away to a point (3m, 4m)? Assume there are no other charges.

PRACTICE: WORK TO ASSEMBLE A TRIANGLE OF CHARGES

What work is needed to assemble an equilateral triangle of side length 5 cm, with a 5 μC charge at each vertex?

EXAMPLE: SPEED OF ELECTRON IN UNIFORM ELECTRIC FIELD

An electron is initially at rest in a uniform, 500 N/C electric field. After traveling 10 cm, what is the electron's speed?