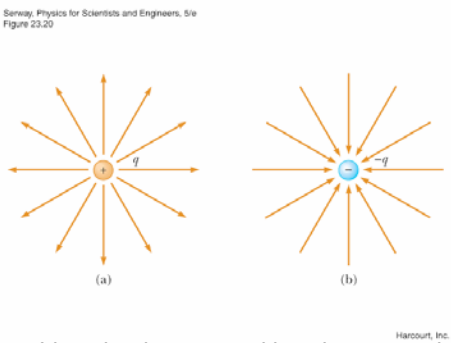
Electric Field Lines



•Same direction as the electric field vector at any point.

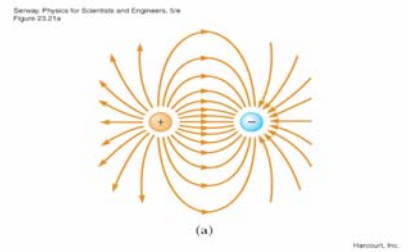
•**E** is tangent to the electric field line

•Number of lines perpendicular to the lines is proportional to the field
- •E small: lines further apart
- •E large: Lines closer

•No two lines can cross

Lines begin on a positive charges and end of negative charges

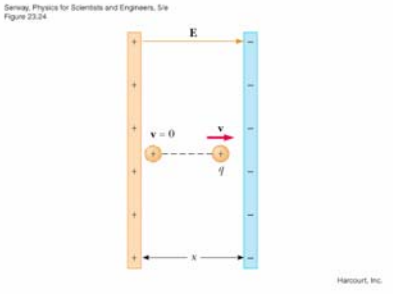
$1/r^2$ behavior from geometry.



43. A proton accelerates from rest in a uniform electric filed of 640 N/C. At some later time its speed has reached 1.2×10^6 m/s.

- find the acceleration of the proton
- how long did it take the the proton to reach this speed ?
- How far has it moved in this time ?
- What is its kinetic energy at this time ?

23.43 (a) $a = \dfrac{qE}{m} = \dfrac{(1.602\times10^{-19})(640)}{(1.67\times10^{-27})} = \boxed{6.14\times10^{10}\ \text{m/s}^2}$



(b) $v = v_i + at$

$1.20\times10^6 = (6.14\times10^{10})t$

$\boxed{t = 1.95\times10^{-5}\ \text{s}}$

(c) $x - x_i = \frac{1}{2}(v_i + v)t$

$x = \frac{1}{2}(1.20\times10^6)(1.95\times10^{-5}) = \boxed{11.7\ \text{m}}$

(d) $K = \frac{1}{2}mv^2 = \frac{1}{2}(1.67\times10^{-27}\ \text{kg})(1.20\times10^6\ \text{m/s})^2 = \boxed{1.20\times10^{-15}\ \text{J}}$