Quiz Mk. 1

Fool: The reason why the seven stars are no more than seven's a pretty one, ...

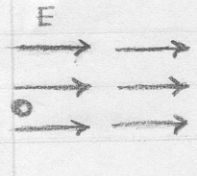
Lear: Because they were not eight?

Fool: Aye my lord. Thou wouldst make a good fool.

→ A particle of mass m and charge q starts at rest in a uniform E field. It is released and then free to move.

After a time t: What is the velocity of the particle? • 3 pts
How far did it go? • 2 pts
If it starts at point A and ends up at point B, What is V_{AB}? • 4 pts

let: $m = 1\ gm$
$q = 1\ \mu C$
$E = 100{,}000\ N/C$
$t = 1\ sec$



a) $F = qE = ma$

$a = qE/m$

$V = at = \frac{qE}{m} t$

$= \left(\frac{1 \times 10^{-6}\ C \cdot 1 \times 10^{5}\ N/C}{1 \times 10^{-3}\ kg} \right) 1\ sec$

$= \underline{100\ m/s}$ *

b) $d = \frac{1}{2} a t^2$

$= \frac{1}{2} (100\ m/s^2)(1\ s)^2 = \underline{50\ m}$ *

c) $V_{AB} = \frac{\Delta W}{q} = \frac{\Delta KE}{q} = \frac{\frac{1}{2} m v^2}{q}$

or $V_{AB} = \frac{\Delta W}{q} = F \cdot d/q = \frac{qEd}{q} = Ed$

first way: $\frac{1}{2} (10^{-3}\ kg)(10{,}000)\ m^2/s^2 \Big/ 10^{-6}\ \mu C = \underline{5 \times 10^7\ J/C}$ *

second way: $100{,}000\ N/C \cdot 50\ m = \underline{5 \times 10^7\ J/C}$ *

Note: V_{AB} ought not depend on velocity. So check this out:

$E = \frac{1}{2} m v^2 = \frac{1}{2} m (at)^2 = \frac{1}{2} ma (at^2) = mad$

$= m \frac{qE}{m} d$

$= qEd!$ so $V_{AB} = Ed$

The velocity imparted is precisely enough to make everything balance!