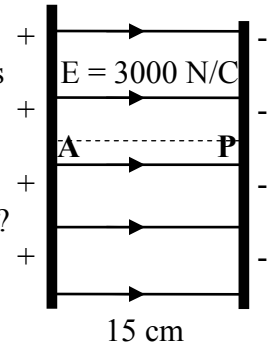
PHYSICS 12 ELECTROSTATICS WORKSHEET 3

1. The voltage between two ends of a 2.0 m wire is 100 V. What is the electric field of the wire?

2. An electron starts from rest and is accelerated through a potential difference of 12 V.
   a) How much work was done on the electron?
   b) How much energy did the electron gain?
   c) What is the final speed of the electron?

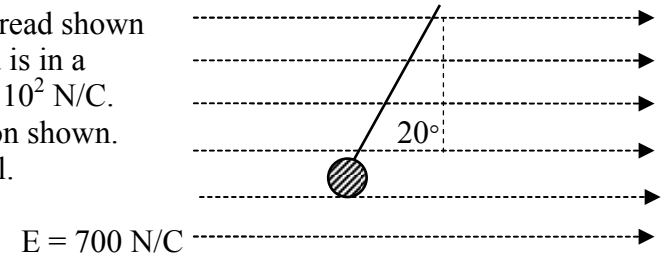
3. An electron, 1.6 m away from a -1.25×10^{-8} C charged particle, travels at 4.8×10^{6} m/s directly towards the particle. How close does it get?

4. Two charged metal plates in a vacuum are 0.15 m apart as shown. The electric field between the plates is uniform and has an intensity of 3.0×10^{3} N/C. An electron is released from rest at point **P** just beside the negative plate.

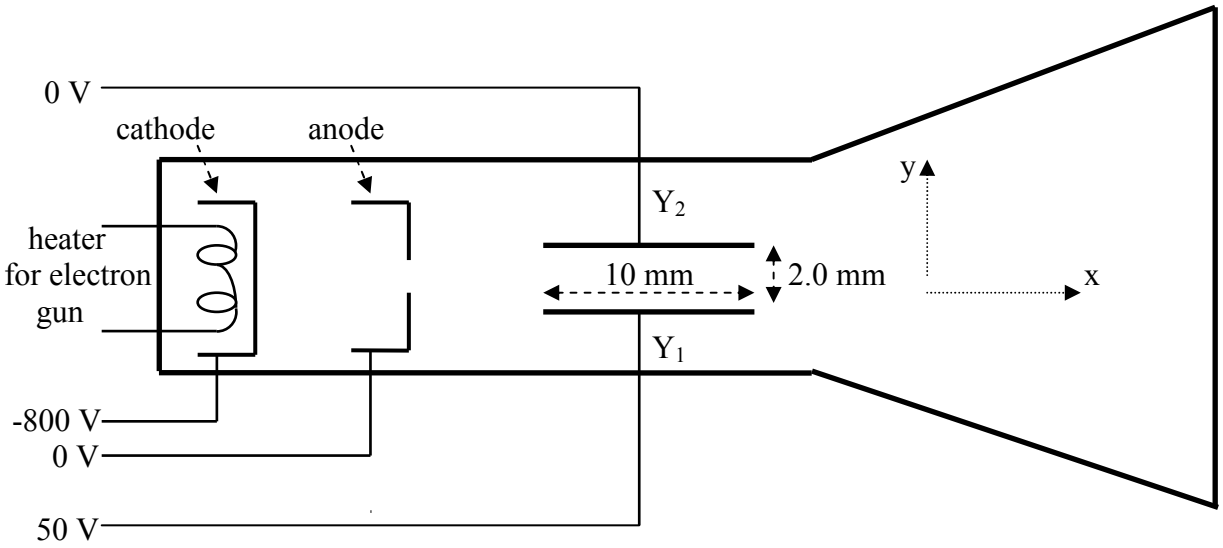


   a) How long will it take to reach the other plate at **A**?
   b) How fast will it be going just before it hits?
   c) Another electron is shot straight upward from **P** at 5.0×10^{6} m/s. How far above **A** will it strike the positive plate?
   d) Next, a proton is shot with a speed of 2.0×10^{5} m/s towards **P** from **A**. What will be its speed just before hitting the plate at **P**?

5. The tiny ball at the end of the thread shown at right has a mass of 0.60 g and is in a horizontal electric field of 7.0×10^{2} N/C. It is in equilibrium in the position shown. Determine the charge on the ball.



6. For questions a-g, refer to the CRT diagram below. It shows accelerating voltage, deflecting voltage, plus all relevant information to answer the questions below.



a) What is the electric field strength between anode and cathode?
b) What is the velocity $\mathbf{v_x}$ of an electron as it starts from rest at the cathode and leaves through the anode?
c) Determine the time for an electron, which passes through the final anode, to pass through the region between the Y-plates, in the x-direction.
d) If there is a uniform deflecting potential difference of 50 V across the Y-plates, find the force $\mathbf{F_y}$ on the electron.
e) Find the acceleration $\mathbf{a_y}$ of the electron between the Y-plates.
f) Use kinematics to determine the y-deflection $\mathbf{d_y}$ after passing through the Y-plates.
g) If the accelerating voltage is now halved, and the deflecting voltage doubled, what is the new value for $\mathbf{d_y}$?

7. The deflecting plates of a CRT are 20.0 cm long and have a separation of 5.00 cm. A deflecting voltage of 90.0 V is applied across these plates, causing a beam of electrons to deflect 2.50×10^{-4} m perpendicular to the original path.
a) What is the field intensity between the plates?
b) What is the vertical speed of the electrons after the deflection?
c) After the deflection, the electrons leave the plates with a speed of 3.12×10^{6} m/s. Determine the horizontal speed of the electrons and the accelerating voltage $\mathbf{V_a}$ in the electron gun that was used to bring them up to this speed.

1. 50 N/C 2. a) 1.9×10^{-18} J b) 1.9×10^{-18} J c) 2.0×10^{6} m/s 3. 0.83 m
4. a) 2.4×10^{-8} s b) 1.3×10^{7} m/s c) 0.12 m d) 3.6×10^{5} m/s 5. -3.1×10^{-6} C
6. a) 4.0×10^{4} N/C b) 1.7×10^{7} m/s c) 6.0×10^{-10} s d) 4.0×10^{-15} N e) 4.4×10^{15} m/s^2 f) .79 mm g) 3.2 mm
7. a) 1.8×10^{3} N/C b) 3.98×10^{5} m/s c) 3.09×10^{6} m/s; 27.3 V