**Physics 30 – Lesson 17**

**Parallel Plates**

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**Practice problems**

1. a. To find acceleration we use the principles involving forces.



b. To find speed we use the principle of conservation of energy.



B. Moving the proton 3.0 cm is perpendicular to the plates – the change in potential is



2)

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6.0 cm

75 V

0 V

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A. Moving the proton parallel to the plates – since there is no change in potential, no work is done.



3.

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4.



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**Assignment**

1)



/3

2)



/3

3)



/3

4)



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5)



•



/4

6)



We may calculate the angle from the geometry of the string.



The forces acting on the ball are T, FE and Fg and the net force acting on the ball is 0. Therefore, the x component of T equals FE and the y component equals Fg.

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b)

a)



d)

c)



7)



a)

/11

b)



c)

The electron gained 300 V of potential in the first potential difference. Therefore, it will require 300 V to stop the electron. The electron will stop at the 300 V point in the second potential difference.



d) Goes back the same path, but opposite work is done.



8)



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9)

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10)



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11)



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12)



-1000 V

-750

-500

-250

+250

+500

+75000

+1000 V

0

/8



13)

+ + + + + + + + + + + + + + + + + + + + + + + +

dx

3.00 cm

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1.00 cm

/8

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The electrons enter the electric field and experience a vertical force due to repulsion from the negative plate and attraction to the positive plate. **Since the electric field between the plates is uniform (i.e. the same throughout the region) the resulting vertical acceleration will be uniform**. However, the original horizontal motion will **not** be affected since there is no force acting horizontally on the electrons. Therefore they will accelerate toward the positive plate while maintaining their horizontal velocity.

We can solve for the horizontal distance by treating the electron like a projectile from Physics 20. Note that the initial vertical velocity is zero (vi = 0) and the acceleration due to gravity (–9.81 m/s2) is negligible compared to the acceleration due to the electric field (+5.2689 × 1014 m/s2).



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