

## PHYS 214 Section 2 – Spring 2007, Test 2

### Practice questions and problems taken from tests given in previous semesters

#### Questions

1. An astronomical telescope has an objective lens of focal length  $f_o = 76$  cm, and an eyepiece lens of focal length  $f_e = 2.8$  cm. What is its magnification?
2. A plastic object like a ruler or a pen that has been rubbed with a cloth can attract small pieces of paper. How can this happen, if the paper is not charged?
3. Explain what the electric potential is.
4. A proton is accelerated by the potential difference  $V$  between two metal plates a distance  $d$  apart. It leaves one plate at rest and reaches the other plate with a speed  $v$ .  
With what speed would the proton reach the other plate if the distance  $d$  was doubled?  
(a)  $v$ .      (b)  $v/2$ .      (c)  $2v$ .      (d)  $0.71v$ .      (e)  $1.41v$ .      (f) It wouldn't get there.  
With what speed would the proton reach the other plate if the voltage  $V$  was doubled?  
(a)  $v$ .      (b)  $v/2$ .      (c)  $2v$ .      (d)  $0.71v$ .      (e)  $1.41v$ .      (f) It wouldn't get there.  
With what speed would a deuterium nucleus reach the other plate? (Same charge, twice the mass.)  
(a)  $v$ .      (b)  $v/2$ .      (c)  $2v$ .      (d)  $0.71v$ .      (e)  $1.41v$ .      (f) It wouldn't get there.  
With what speed would an electron reach the other plate?  
(a)  $v$ .      (b)  $v/2$ .      (c)  $2v$ .      (d)  $0.71v$ .      (e)  $1.41v$ .      (f) It wouldn't get there.

#### Problems

1. You are holding a lens, and place an object at a distance of 3.00 cm in front of it. When you look through the other side of the lens, you see an upright image of the object, that is twice as tall as the object. What is the focal length of this lens, and is the lens a converging or diverging one? In addition to your calculations, draw a ray diagram of the situation, showing the lens and the location and size of object and image.
2. A charge of  $2.0 \mu\text{C}$  is located at the 0.00-cm mark of a meter stick, and a charge of  $-8.0 \mu\text{C}$  is located at the 1.00 m mark. If there are no other charges around, what are the electric field and the electric potential at the 20.0-cm mark?
3. Four charges are placed at the vertices of a square of 20.0 cm side length. The ones on the left are each  $-8.00$  mC, and the ones on the right are each  $+8.00$  mC. What are the electric field and the electric potential at the center of the square? What electric force would an electron feel if placed there, and what potential energy would it have?
4. Two square metal plates of 10-cm side length are placed parallel to each other at a distance of 1.00 cm. You attach a wire to each plate, put the whole thing in a vacuum, and connect the wires to a 12.0-V car battery. If an electron is released at rest near the negative plate, with what speed will it be moving when it hits the positive plate? The mass of the electron is  $9.11 \times 10^{-31}$  kg.