

# Exam 1 – white version

Physics 2760

SP 2013

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Last Name Key

First Name \_\_\_\_\_

ID # \_\_\_\_\_ Lab Section # \_\_\_\_\_

This is a closed book exam. I understand, pursuant to University Regulations on academic honesty, that I am not to use any notes or information other than what is in the official, non-annotated formula sheet.

Signature \_\_\_\_\_

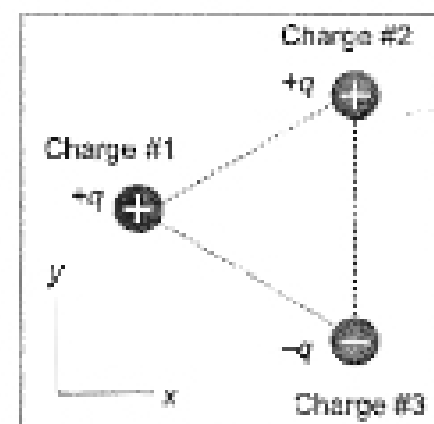
For multiple choice questions, please make sure that you circle the letter for the answer which you believe to be correct and only that answer. If more than one answer is circled for the same problem, you will not receive credit for it. Don't get hung up on questions. They should take only one or two minutes each. If you find yourself spending more than a few minutes on a multiple choice question you are probably looking at it the wrong way. You should skip it for now and come back to it later.

For full credit show your work for solutions to questions that require calculations. Explain from where you start to solve the problem and show your math flowing from it for full credit. **No shown work, no credit!**

During the exam, if you have questions please raise your hand and the TA or the instructor will come to you and provide help.

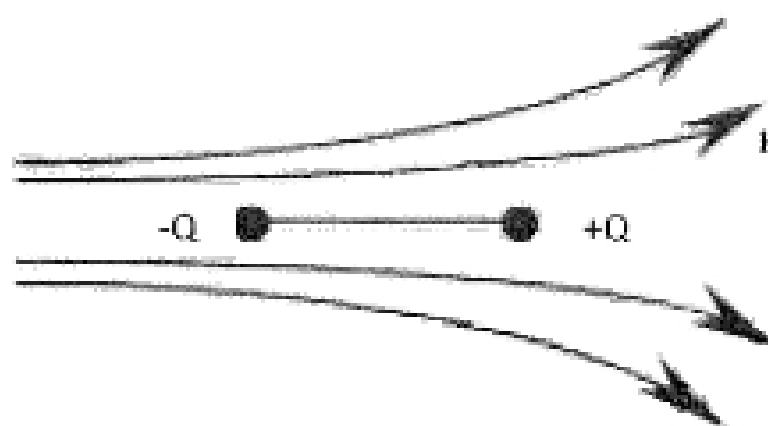
**The last page is the formula sheet. Feel free to tear it off. You may keep the formula sheet after the exam.**

1. (5 points) Three point charges lie at the vertices of an equilateral triangle as shown. All three charges have the same magnitude, but charges #1 and #2 are positive (+q) and charge #3 is negative (-q). The net electric force that charges #2 and #3 exert on charge #1 is in



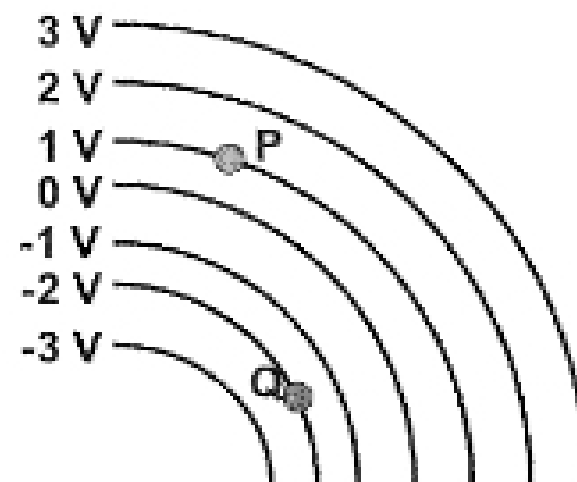
- a) the +x-direction.  
 b) the -x-direction.  
 c) the +y-direction.  
 d) the -y-direction.  
 e) none of the above

2. (5 points) A rigid electric dipole (positive charge on the right and negative charge on the left) is free to move in the electric field represented in the figure. Which one of the following phrases most accurately describes the initial motion of the dipole if it is released from rest in the position shown? (Hint: The electric fields at -Q and at +Q have the different magnitude.)



- a) It moves to the left.  
 b) It moves to the right.  
 c) It does not move at all.  
 d) It moves toward to the top of the page.  
 e) It moves toward the bottom of the page.

3. (5 points) How much work must you do (external work) to move a negative charge -1 C from point P to point Q in the electric field shown below (represented by equipotential lines)?



- a) 3 J  
 b) 2 J  
 c) 1 J  
 d) 0 J  
 e) -1 J  
 f) -2 J  
 g) -3 J  
 h) Cannot be calculated since the path is not given.

4. (5 points) Gaussian surfaces A and B enclose the same positive charge  $+Q$ . The area of Gaussian surface A is three times larger than that of Gaussian surface B. The electric flux through Gaussian surface A is
- nine times larger than the electric flux through Gaussian surface B.
  - three times larger than the electric flux through Gaussian surface B.
  - equal to the electric flux through Gaussian surface B.
  - three times smaller than the electric flux through Gaussian surface B.
  - unrelated to the electric flux through Gaussian surface B.

5. (5 points) A positive charge is kept (fixed) off-center inside a fixed spherical conducting shell that is electrically neutral, and the charges in the shell are allowed to reach electrostatic equilibrium. The large positive charge inside the shell is roughly 16 times that of the smaller charges shown on the inner and outer surfaces of the spherical shell. Which of the following figures best represents the charge distribution on the inner and outer walls of the shell?

- 1
- 2
- 3
- 4
- 5

