

Syllabus

Physics for Scientists and Engineers II

PHYS 2049

Fall Semester, 2010

TR 4:30 to 5:45 pm, MAP 260

Instructor: Masahiro (Masa) Ishigami

Office Hours: TR 5:45-6:45 pm

Office: PSB 110

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Webpage: <http://physics.ucf.edu/~ishigami/teaching.html>

Required Course Materials

Textbook: Physics For Scientists and Engineers with Modern Physics 8th Edition
(Volume 2)

Other *Highly Recommended* Resources: Walter Lewin's web lectures

<http://ocw.mit.edu/OcwWeb/Physics/8-02Electricity-and-MagnetismSpring2002/VideoAndCaptions/index.htm>

Webassign: all assignments will be given via web-assign at www.webassign.net . Access card must be purchased at the UCF bookstore and students should register as soon as possible (**by Thursday, 8/25**). Username is “**firstnamelastname**”. The password has been set to “**physics**”. **Email me if you run into a problem as soon as possible: I may have to reset passwords. Note that if you had a webassign account previously your password/username has been reset.**

I-Clicker: You must purchase an I-clicker for participating in in-class quizzes. You must have come to class at least once and voted on at least one question, in order to complete the registration. If you have voted on a question in my class, go to www.iclicker.com/registration. Complete the fields with your first name, last name, student ID. Your student id should be your **EmplID**. The remote ID is the series of numbers and sometimes letters found on the bottom of the back of your i-clicker remote. Please bring your remote daily starting from **8/30 (Tuesday)**.

Course Structure:

Lectures: Tuesday and Thursday

Laboratory: Concurrent registration is required.

Graded Assignments: Due Tuesdays. Note first assignment due 8/30. Problem sets will be given every week via webassign.

Quizzes: Quizzes will be given in-class via i-clicker. Please bring remote to each class.

Exams: You MUST bring a number two (2) pencil (preferably several) or pen with black ink and a SCANtron sheet (with the UCF logo on it) to each exam. **Mid Terms:** There will be two written “in-class” exams each 75 minutes in duration. No formula sheets are allowed. **Final Exam:** 6-8 problems. **No** formula sheets are allowed in any exams.

Grading

Laboratory: 20%

Homework: 7.5%

In-class participation, quizzes (I-clicker): 12.5%

Midterms (two): 30%

Final: 30%

Grading Scale:

A: Understanding all major concepts

B: Understanding all major concepts, but making some mistakes on tests

C: Did not understand one major concept

D: Not adequate understanding of more than one concept

F: Failure to understand any concepts

Important Laboratory Policy

Missing 3 labs without excuses means failing the ENTIRE COURSE.

Policies:

1. Grades on midterm exams can be contested up one week. Final exam grades and final grades are not contestable.
2. Make-up tests are given only to students who have to be out of town on university-sponsored activities. see policies.ucf.edu. Prior permission and proper documentation are required a week in advance in writing by writing [email is not accepted]. Exceptions can be made only for medical emergencies at the discretion of the instructor.
3. Scientific calculators with trigonometric capabilities are allowed in quizzes and tests. However, calculators with preprogrammed physics information are not allowed. Violation of this rule will result in automatic failure in the course and disciplinary proceedings will be initiated.
4. **Picture ID** is required in all tests, quizzes and final exams.

Important Dates:

8/23: First class

10/27: Last day to drop the course

12/1: Last class

Holidays: 11/24

Course Schedule:

Mid-Term Exam 1: 9/29 (Thursday) Mid-Term Exam 2: 11/10 (Thursday)

Comprehensive final: 12/8 (Thursday) 4:00-6:50 pm

Electricity	Ch 23, 24, 25, 26	Very difficult : Exam 1
DC circuit	Ch 27, 28	Easy
Magnetism	Ch 29-32	Very difficult: Exam 2
AC circuit	Ch 33	Average
EM waves	Ch 34	Average

Study suggestions:

1. Do example problems in the chapter
2. Do problems at the end of the chapter
3. Ask questions and stop lectures
4. Ask questions at the labs
5. Go to the SI sessions
6. Come to office hours

Example 23.2

Find the Resultant Force

Consider three point charges located at the corners of a right triangle as shown in Figure 23.7, where $q_1 = q_3 = 5.00 \mu\text{C}$, $q_2 = -2.00 \mu\text{C}$, and $a = 0.100 \text{ m}$. Find the resultant force exerted on q_3 .

SOLUTION

Conceptualize Think about the net force on q_3 . Because charge q_3 is near two other charges, it will experience two electric forces. These forces are exerted in different directions as shown in Figure 23.7.

Categorize Because two forces are exerted on charge q_3 , we categorize this example as a vector addition problem.

Analyze The directions of the individual forces exerted by q_1 and q_2 on q_3 are shown in Figure 23.7. The force \vec{F}_{23} exerted by q_2 on q_3 is attractive because q_2 and q_3 have opposite signs. In the coordinate system shown in Figure 23.7, the attractive force \vec{F}_{23} is to the left (in the negative x direction).

The force \vec{F}_{13} exerted by q_1 on q_3 is repulsive because both charges are positive. The repulsive force \vec{F}_{13} makes an angle of 45.0° with the x axis.

Use Equation 23.1 to find the magnitude of \vec{F}_{23} :

$$F_{23} = k_e \frac{|q_2||q_3|}{a^2} = (8.99 \times 10^9 \text{ N} \cdot \text{m}^2/\text{C}^2) \frac{(2.00 \times 10^{-6} \text{ C})(5.00 \times 10^{-6} \text{ C})}{(0.100 \text{ m})^2} = 8.99 \text{ N}$$

Find the magnitude of the force \vec{F}_{13} :

$$F_{13} = k_e \frac{|q_1||q_3|}{(\sqrt{2}a)^2} = (8.99 \times 10^9 \text{ N} \cdot \text{m}^2/\text{C}^2) \frac{(5.00 \times 10^{-6} \text{ C})(5.00 \times 10^{-6} \text{ C})}{2(0.100 \text{ m})^2} = 11.2 \text{ N}$$

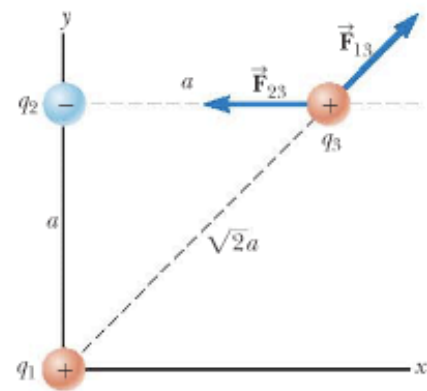


Figure 23.7 (Example 23.2) The force exerted by q_1 on q_3 is \vec{F}_{13} . The force exerted by q_2 on q_3 is \vec{F}_{23} . The resultant force \vec{F}_3 exerted on q_3 is the vector sum $\vec{F}_{13} + \vec{F}_{23}$.

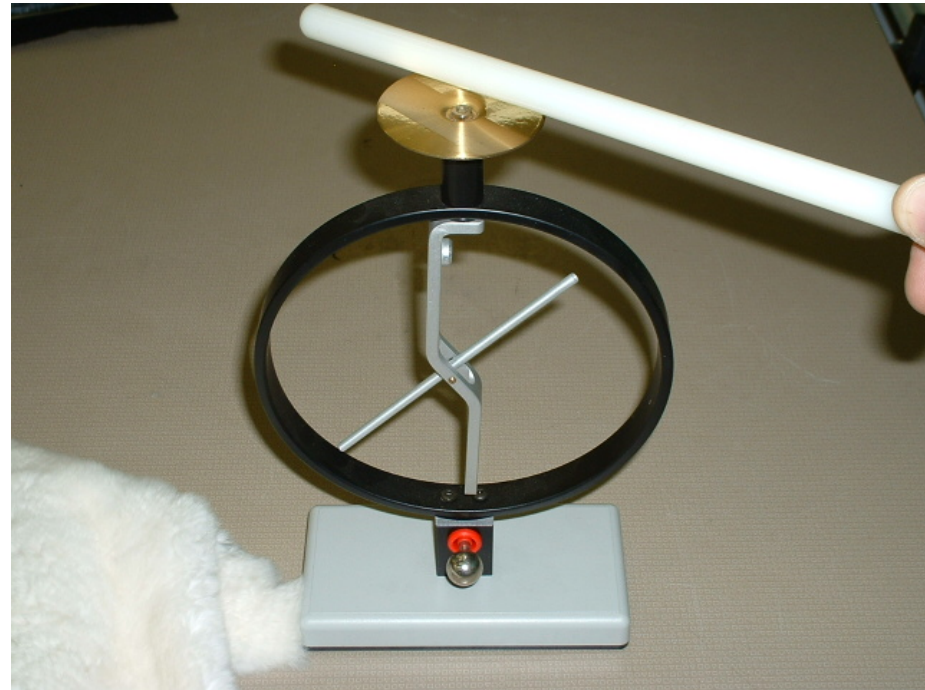
Difference from 2048?

$F = ma$: no acceleration without force

Demos



EM 318



EM 324

There are charges + and - :

The same signs repel each other

The opposite signs attract each other

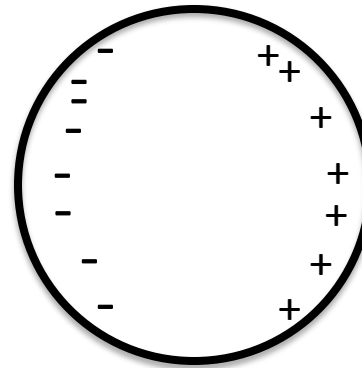
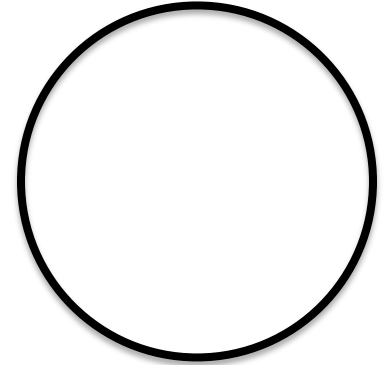
Conductors: charges move freely

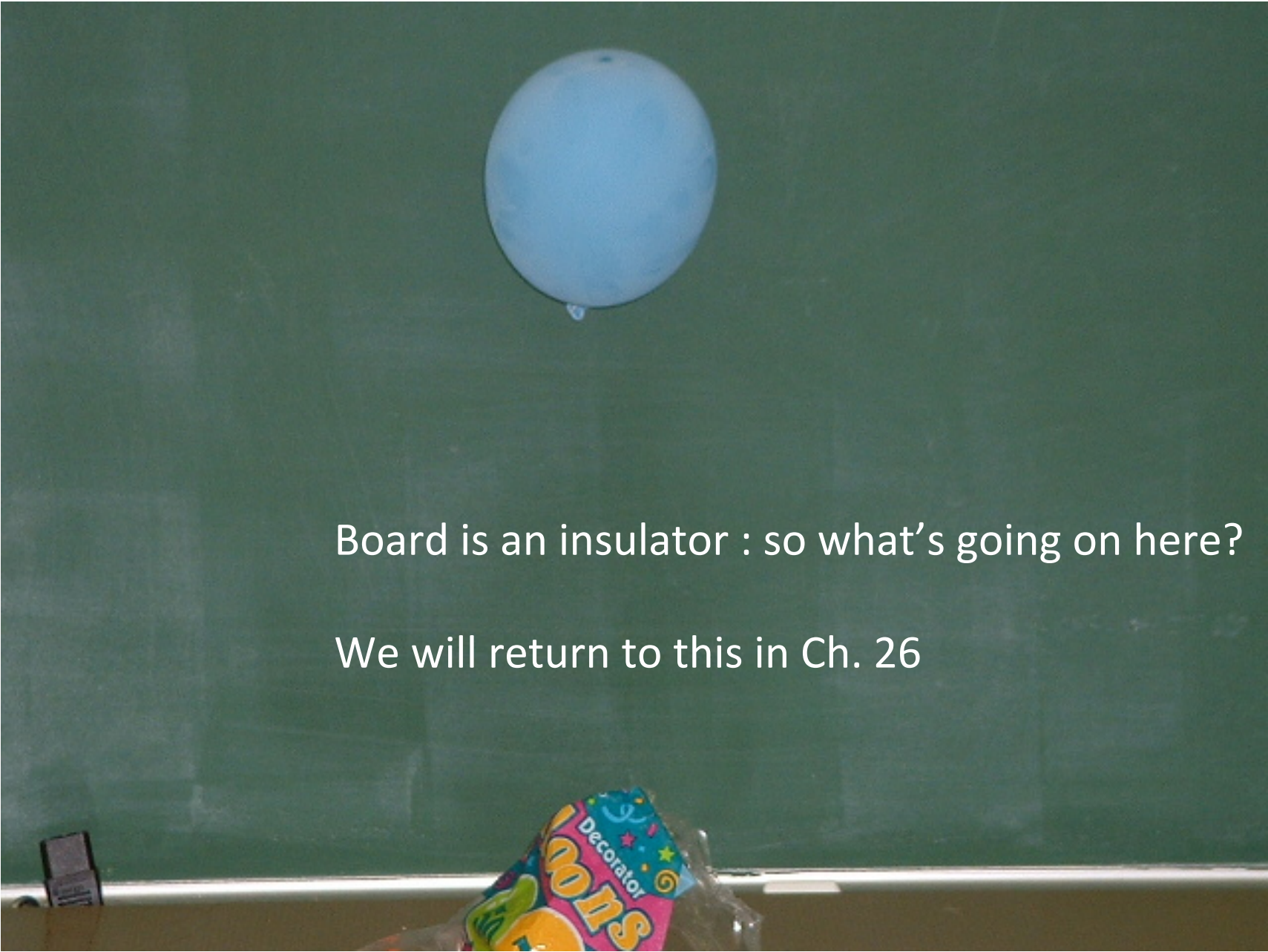
Insulators: charges are bound and cannot move



EM 338

Metals: charges can move freely

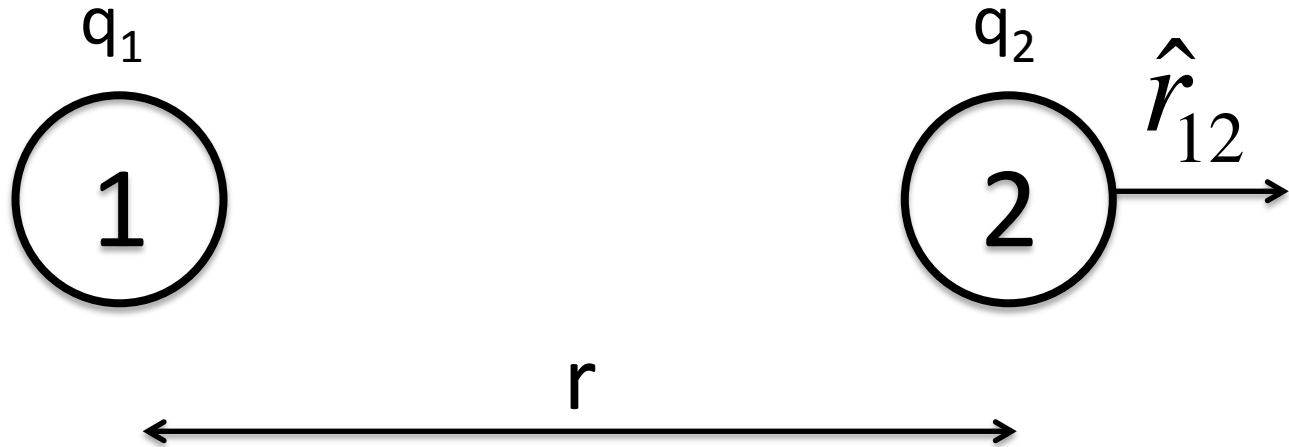


A photograph of a classroom setting. A large, light blue balloon is suspended in the air, centered in the upper half of the frame. The background is a dark green chalkboard. In the foreground, at the bottom center, is a colorful bag of 'Decorators' brand lollipops. To the left of the lollipops, a small black object, possibly a phone or a small sign, is visible on the ledge of the chalkboard.

Board is an insulator : so what's going on here?

We will return to this in Ch. 26

Coulomb's law



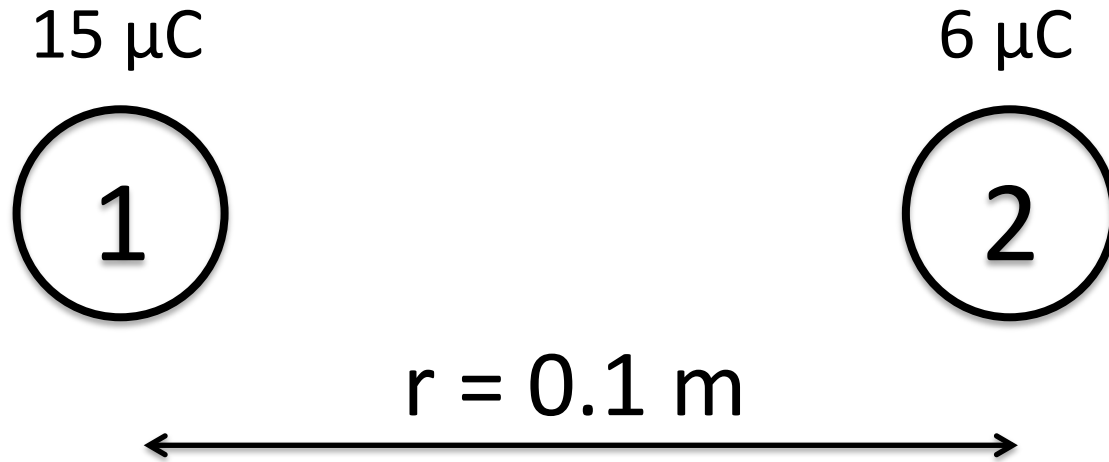
Force on 2 by 1

$$\vec{F}_{12} = \frac{1}{4\pi\epsilon_0} \frac{q_1 \times q_2}{r^2} \hat{r}_{12}$$

$$\epsilon_0 = 8.854 \times 10^{-12} \frac{C^2}{Nm} \quad C: \text{Coulomb, unit for charge}$$

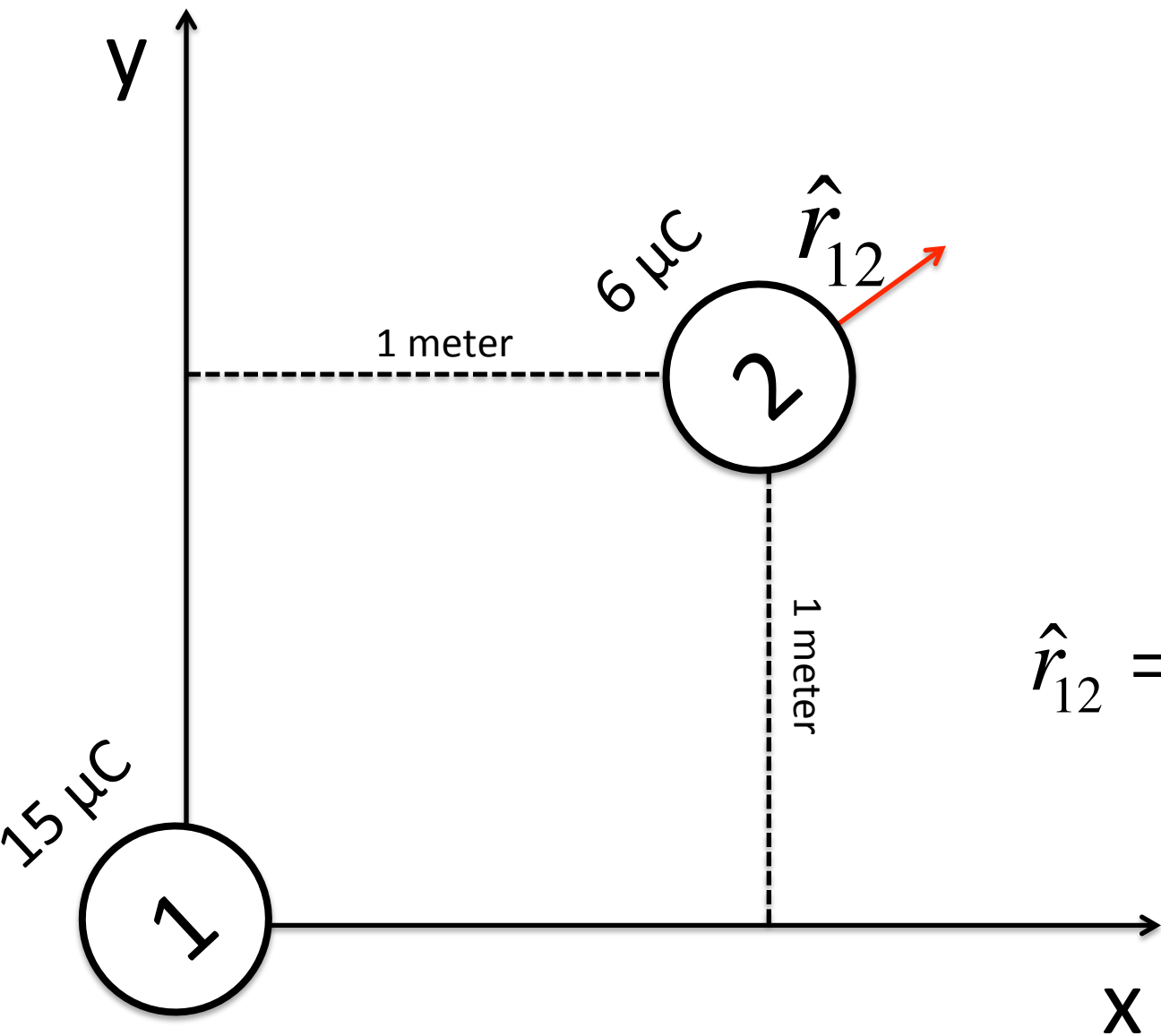
Electron charge: $e = -1.6 \times 10^{-19} C$

Example 1:



What is the magnitude of the force between these charges?

What is \hat{r}_{12} ?



$$\hat{r}_{12} = \frac{(1,1)}{\sqrt{2}} = \frac{\hat{x} + \hat{y}}{\sqrt{2}}$$