

Ch3 HW3 (1425146)

Current Score: 0/23 Due: Wed Sep 22 2010 09:00 AM EDT

Question	1	2	3	4	5	Total
Points	0/2	0/1	0/1	0/2	0/7	0/23

Description

Electric force

Instructions


Reading: Section 3.6

1. 0/2 points


MI3 3.6.X.014. [1259422]

A moving electron passes near the nucleus of a gold atom, which contains 79 protons and 118 neutrons. At a particular moment the electron is a distance of 8.5×10^{-9} m from the gold nucleus.

(a) What is the magnitude of the electric force exerted by the gold nucleus on the electron?

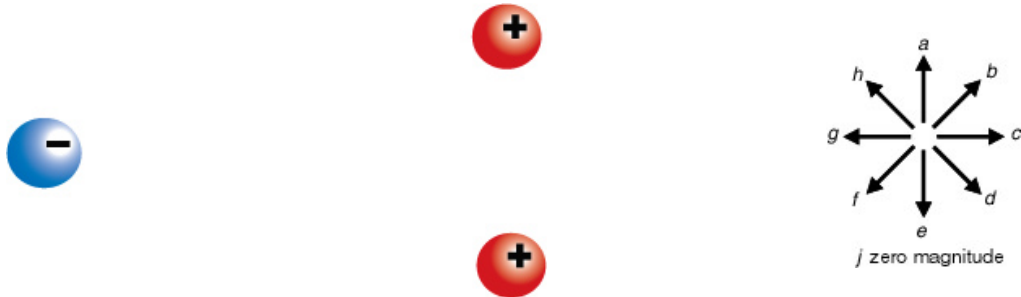
$|\vec{F}_{\text{on electron}}| =$  $2.52e-10$ N

(b) What is the magnitude of the electric force exerted by the electron on the gold nucleus?

$|\vec{F}_{\text{on gold nucleus}}| =$  $2.52e-10$ N

2. 0/1 points

MI2 03.RQ.29 [1200233]

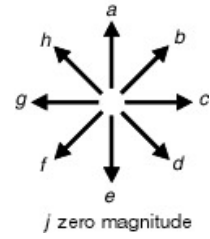


The diagram above shows two positively charged objects and one negatively charged object. The absolute value of the charge on each object is the same. Which arrow (a-j) best represents the direction of the net electric force on the negatively charged object?

 C

3. 0/1 points

MI2 03.RQ.30 [1200324]



The diagram above shows two negatively charged objects and one positively charged object. The absolute value of the charge on each object is the same. Which arrow (a-j) best represents the direction of the net electric force on the positively charged object?



4. 0/12 points

MI3 3.6.P.052. [1544854]

(a) Two thin hollow plastic spheres, about the size of a ping-pong ball with masses ($m_1 = m_2 = 2\text{e-}3$ kg) have been rubbed with wool. Sphere 1 has a charge $q_1 = -2\text{e-}9$ C and is at location $\langle 50\text{e-}2, -20\text{e-}2, 0 \rangle$ m. Sphere 2 has a charge $q_2 = -4\text{e-}9$ C and is at location $\langle -50\text{e-}2, 40\text{e-}2, 0 \rangle$ m. It will be useful to draw a diagram of the situation, including the relevant vectors.

What is the relative position vector pointing from q_1 to q_2 ?

$$\vec{r} = \boxed{} \langle -1.00, 0.600, 0.00 \rangle \text{ m}$$

What is the distance between q_1 and q_2 ?

$$|\vec{r}| = \boxed{} \text{ 1.17 m}$$

What is the unit vector \hat{r} in the direction of \vec{r} ?

$$\hat{r} = \boxed{} \langle -0.857, 0.514, 0 \rangle$$

What is the magnitude of the gravitational force exerted on q_2 by q_1 ?

$$|\vec{F}_{\text{grav on } q_2}| = \boxed{} \text{ 1.97e-16 N}$$

What is the gravitational force (vector) exerted on q_2 by q_1 ?

$$\vec{F}_{\text{grav on } q_2} = \boxed{} \langle 1.69\text{e-}16, -1.01\text{e-}16, 0 \rangle \text{ N}$$

What is the value of $\frac{1}{4\pi\epsilon_0} \frac{q_1 q_2}{|\vec{r}|^2}$?

$$\boxed{} \text{ 5.29e-08 N}$$

What is the electric force (vector) exerted on q_2 by q_1 ?

$$\vec{F}_{\text{electric on } q_2} = \boxed{} \langle -4.54\text{e-}08, 2.72\text{e-}08, 0 \rangle \text{ N}$$

(b) What is the ratio of the magnitude of the electric force to the magnitude of the gravitational force?

$$\frac{|\vec{F}_{\text{electric}}|}{|\vec{F}_{\text{grav}}|} = \boxed{} \text{ 2.69e+08}$$

(You see that electric forces between two small charged objects are typically very much larger than gravitational forces between those same small objects. It takes the entire mass of the Earth to exert a sizable gravitational force on a small object.)

(c) If the two masses were 4 times farther away (that is, if the distance between the masses were $4 \times |\vec{r}|$), what would be the ratio of the magnitude of the electric force to the magnitude of the gravitational force now?

$$\frac{|\vec{F}_{\text{electric}}|}{|\vec{F}_{\text{grav}}|} = \boxed{} \text{ 2.69e+08}$$

5. 0/7 points

vp_fancart_constant_force_hw_v2 [1512167]

In this question, you will use the program that you wrote in earlier to model the motion of a fan cart. You should download this program from the previous assignment, if you have not already done so.

Test Case - Make sure that your program produces these results before trying the Graded Question.

(1) After downloading this program, set the initial conditions of your computer model to the following:

Mass of your fancart: 0.2908 kg
Time step (deltat) for Test Case: 0.01 s
Final integration time (t): 4.07 s
Initial position of the fancart: <-0.044,0,0> m
Initial velocity of the fancart: <-0.193,0.323,0> m/s
Force of the fan: <-0.074,0,0> N

Your code should print the final position and final velocity of your fancart. If you are unable to get your program to work for the Test Case, you should go to the help session or contact your instructor for help.

Final position of the fancart: <-2.955,1.318,0> m
Final velocity of the fancart: <-1.231,0.323,0> m/s

Graded Question - Make sure that your code works for the Test Case before solving this question

(2) After downloading this program, set the initial conditions of your computer model to the following:

Mass of your fancart: 0.2719 kg
Time step (deltat) for Test Case: 0.01 s
Final integration time (t): 4.26 s
Initial position of the fancart: <0.011,0,0> m
Initial velocity of the fancart: <-0.496,0.431,0> m/s
Force of the fan: <-0.156,0,0> N

Your code should print the final position and final velocity of your fancart.

(a) **Final position** of your fancart:

< , < ,0> m

(b) **Final velocity** of your fancart:

< , < ,0> m/s

(c) **Final momentum** of your fancart:

< , < ,0> m/s

Turn in the VPython program you wrote for this assignment here.

You must turn in a program that runs correctly, an instructor or TA can validate your code at any time and adjust your score. You might download and use this program on a future homework assignment.

It's a good idea to run your program one last time just before turning it in. Sometimes students accidentally turn in the wrong file, or an empty file. To prevent this, **after turning in the file**, click on its name and make sure the file looks right. You must include the standard ".py" extension on the file name.

no file selected

Assignment Details