WebAssign
CH03-HW03-SP12 (Homework)

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PHYS 172-SPRING 2012, Spring 2012
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Current Score : 16 / 16 **Due :** Thursday, January 26 2012 11:59 PM EST

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1. 2/2 points | Previous Answers MI3 3.6.X.014

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 4.5×10^{-9} m from the gold nucleus.

(a) What is the magnitude of the force exerted by the gold nucleus on the electron?
$|\vec{F}_{\text{on electron}}|$ = 8.99e-10 ✓ N

(b) What is the magnitude of the force exerted by the electron on the gold nucleus?
$|\vec{F}_{\text{on gold nucleus}}|$ = 8.99e-10 ✓ N

- *Read the eBook*
- Section 3.6

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2. 1/1 points | Previous Answers

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?

f ✓

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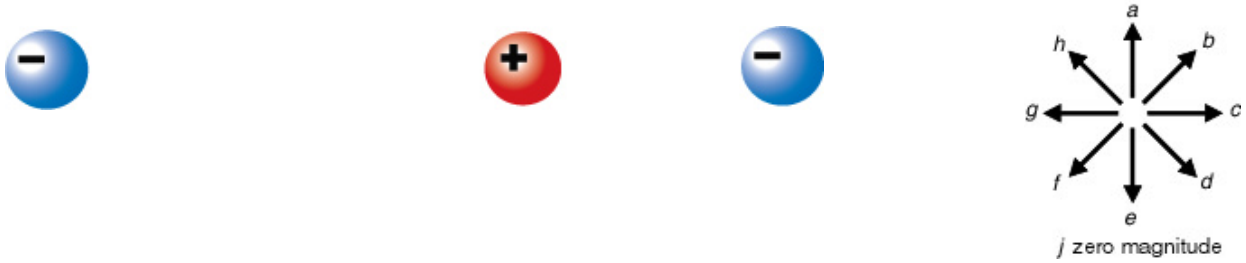
3. 1/1 points | Previous Answers



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?

c ✔

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4. 12/12 points | Previous Answers MI3 3.6.P.052

(a) Two thin hollow plastic spheres, about the size of a ping-pong ball with masses (m_1 = m_2 = 2e-3 kg) have been rubbed with wool. Sphere 1 has a charge q_1 = -3e-9 C and is at location < 20e-2, -20e-2, 0 > m. Sphere 2 has a charge q_2 = -5e-9 C and is at location < -40e-2, 40e-2, 0> 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?

$\vec{r}$ = ✔ m

What is the distance between q_1 and q_2?

$|\vec{r}|$ = 0.85 ✔ m

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

$\hat{r}$ = ✔

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

$|\vec{F}_{\text{grav on } q_2}|$ = 3.71e-16 ✔ N

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

$\vec{F}_{\text{grav on } q_2}$ = ✔ N

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

1.87e-7 ✔ N

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

$\vec{F}_{\text{electric on } q_2}$ = ✔ N

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

$\frac{|\vec{F}_{electric}|}{|\vec{F}_{grav}|}$ = 5.04e8 ✔

(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 2 times farther away (that is, if the distance between the masses were $2\times|\vec{r}|$), what would be the ratio of the magnitude of the electric force to the magnitude of the gravitational force now?

$\frac{|\vec{F}_{electric}|}{|\vec{F}_{grav}|}$ = 5.04e8 ✔

- *Read the eBook*

- Section 3.6