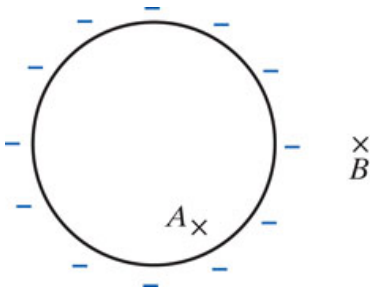
WebAssign
CH16-HW03-FALL2010 (Homework)

Yinglai Wang
PHYS 272-FALL 2012, Fall 2012
Instructor: Virendra Saxena

Current Score : 18.5 / 18.5 **Due :** Friday, September 14 2012 11:59 PM EDT

1. 2/2 points | Previous Answers MI3 16.7.X.055



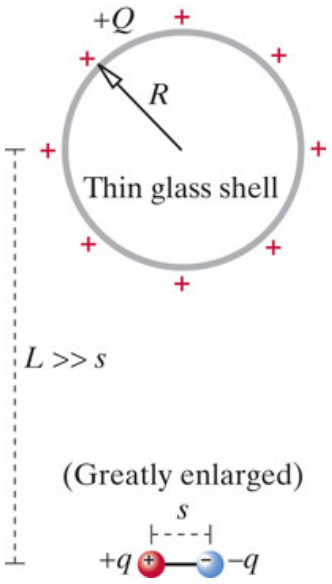
A hollow ball of radius 7 cm, made of very thin glass, is rubbed all over with a silk cloth and acquires a negative charge of -8.5e-08 C which is uniformly distributed all over its surface. Location *A*, shown in the diagram, is inside the sphere, 1 cm from the surface. Location *B*, shown in the diagram, is outside the sphere, 2 cm from the surface. There are no other charged objects nearby.

Which of the following statements about E_{ball}, the magnitude of the electric field due to the ball, are correct? Select all that apply.

- [x] All of the charges on the surface of the sphere contribute to E_{ball} at location *A*.
- [ ] At location *B* E_{ball} is 1.91×10^6 N/C.
- [ ] A hydrogen atom at location *A* would polarize because it is close to the negative charges on the surface of the sphere.
- [x] At location *A* E_{ball} is 0 N/C.

- *Read the eBook*
- Section 16.7

2. 6.5/6.5 points | Previous Answers MI3 16.7.P.064



A small, thin, hollow spherical glass shell of radius *R* carries a uniformly distributed positive charge +*Q*, as shown in the diagram above. Below it is a horizontal permanent dipole with charges +*q* and -*q* separated by a distance *s* (*s* is shown greatly enlarged for clarity). The dipole is fixed in position and is not free to rotate. The distance from the center of the glass shell to the center of the dipole is *L*.

The charge on the thin glass shell is +7e-09 coulombs, the dipole consists of charges of 2e-11 and -2e-11 coulombs, the radius of the glass shell is 0.16 m, the distance *L* is 0.48 m, and the dipole separation is 2e-05 m. Calculate the net electric field at the center of the glass shell. The *x* axis runs to the right, the *y* axis runs toward the top of the page, and the *z* axis runs out of the page, toward you.

[ ] =

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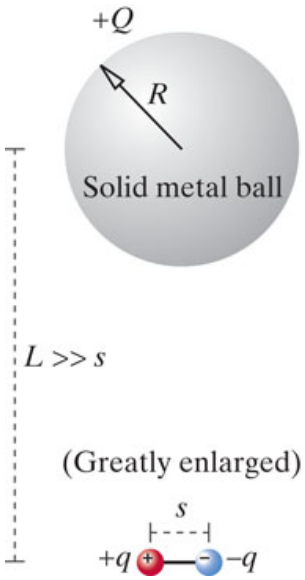
✔ N/C



If the upper sphere were a solid metal ball with a charge +7e-09 coulombs, what would be the net electric field at its center?

[ ] =

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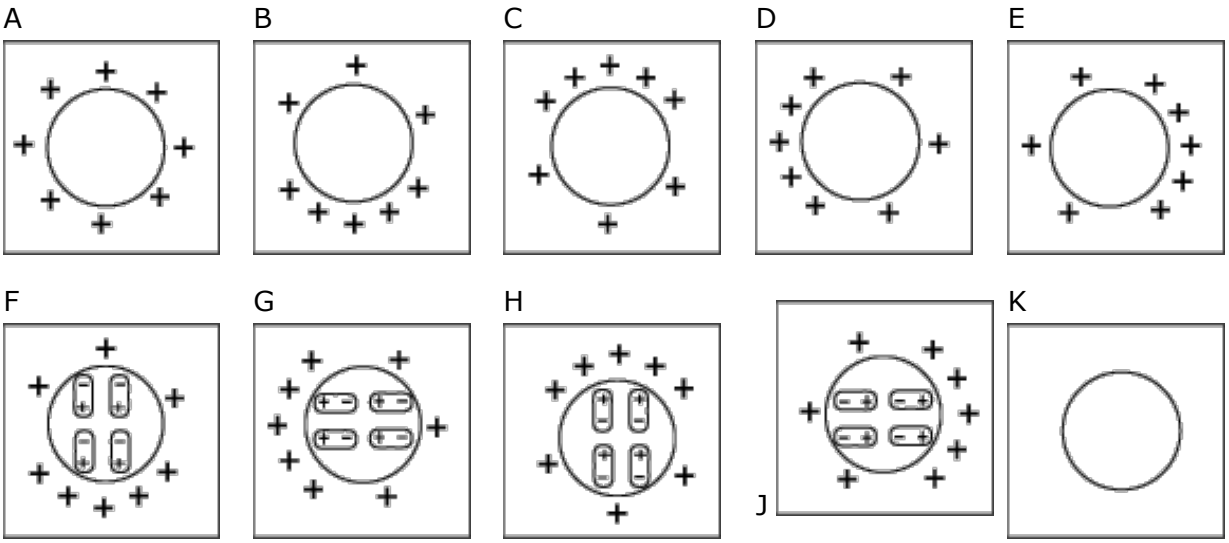
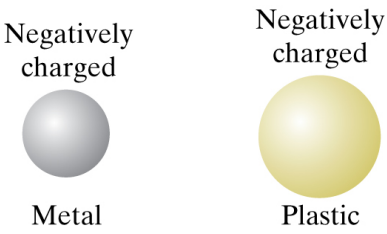
N/C

Which of the diagrams below best shows the charge distribution in and/or on the metal sphere? E



- *Read the eBook*
- Section 16.7

3. 5.5/5.5 points | Previous Answers MI3 16.7.X.053



A solid metal ball of radius 1.4 cm bearing a charge of -17 nC is located near a hollow plastic ball of radius 2 cm bearing a uniformly distributed charge of -6 nC (see the figure) on its outer surface. The distance between the centers of the balls is 8 cm.

Assume the *+x* axis runs to the right, the *+y* axis runs up and the *+z* axis is out.

What is the electric field at the center of the metal ball due only to the charges on the plastic ball?

E^^->_(plastic) = < 8437.5 , 0 , 0 > N/C

What is the net electric field at the center of the metal ball?

= < 0 , 0 , 0 > N/C

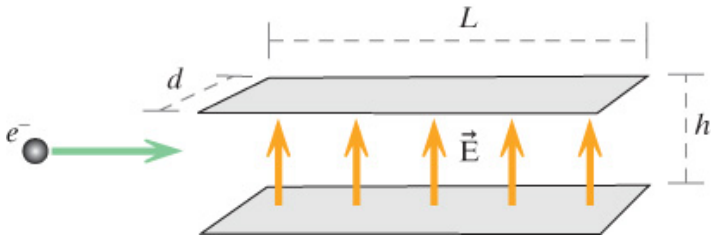
What is the electric field at the center of the metal ball due only to the charges on the surface of the metal ball?

E^^->_(surf) = < -8437.5 , 0 , 0 > N/C

- *Read the eBook*
- Section 16.7

4. 4.5/4.5 points | Previous Answers MI3 16.6.P.042.alt01

In a cathode-ray tube (CRT), an electron travels in a vacuum and enters a region between two "deflection" plates which have equal and opposite charges. The dimensions of each plate are L = 12 cm by d = 5 cm, and the gap between them is h = 2.5 mm. (Note: the diagram is not drawn to scale and the direction of the electric field may not be correct, depending on your randomization.)



During a 0.001 s interval while it is between the plates, the change of the momentum of the electron $\Delta\vec{p}$ is < 0, -5.60e-17, 0 > kg m/s.

What is the electric field between the plates?
Hint: remember the Momentum Principle (the relationship between Impulse and change in momentum.)
$\vec{E}$ =

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✔ N/C

What is the charge (both magnitude and sign) of the upper plate?

q = -1.8585e-8 ✔ C

- *Read the eBook*
- Section 16.6