WebAssign
CH15-HW02-FALL2010 (Homework)

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PHYS 272-FALL 2012, Fall 2012
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Current Score : 14 / 14 **Due :** Friday, September 7 2012 11:59 PM EDT

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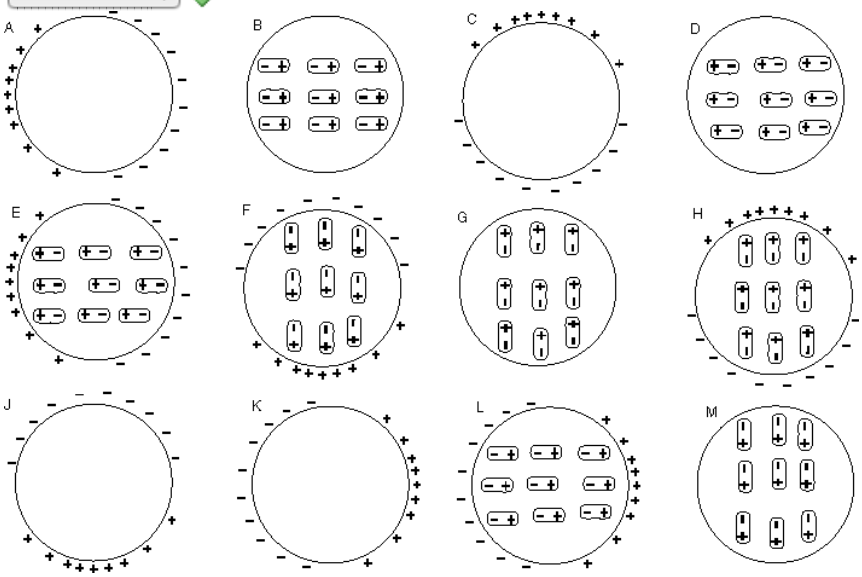
1. 1/1 points | Previous Answers MI3 15.6.X.052

Which of the following diagrams correctly displays the polarization of a metal sphere by an electric field that points to the left, using the conventions discussed in the *Matter and Interactions* textbook?

A ✔



- *Read the eBook*
- Section 15.6

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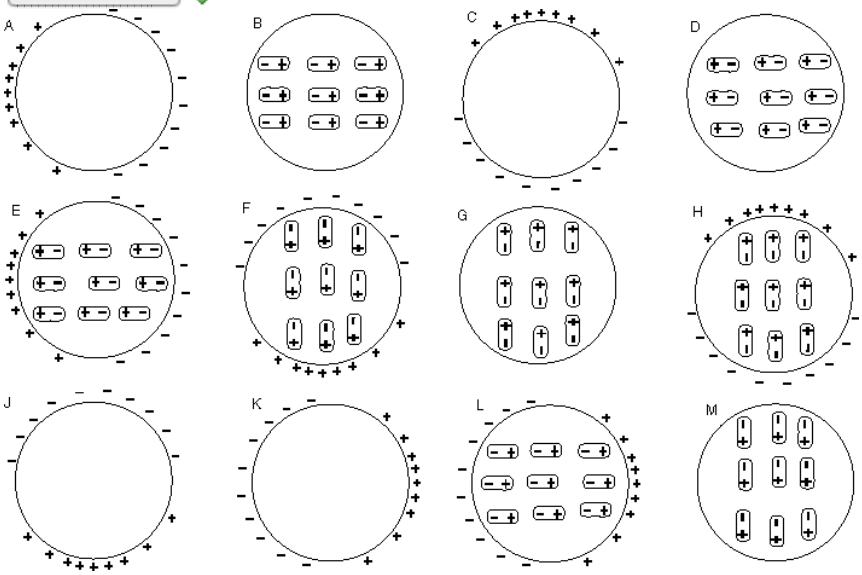
2. 1/1 points | Previous Answers MI2 14.X.07.02

Which of the following diagrams correctly displays the polarization of a plastic sphere by an electric field that points to the right, using the conventions discussed in the *Matter and Interactions* textbook?

B ✔



3. 1/1 points | Previous Answers

In a particular metal, the mobility of the mobile electrons is 0.0067 (m/s)/(N/C). At a particular moment, the electric field everywhere inside a cube of this metal is 0.037 N/C in the +*x* direction.

What is the average drift speed of the mobile electrons in the metal at this moment?

v_{drift} = 0.0002479 ✓ m/s

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4. 1/1 points | Previous Answers

An electric field is applied to a solution containing bromide ions. As a result, the ions move through the solution with an average drift speed of 6.15e-07 m/s. The mobility of bromide ions in solution is 8.09e-08 (m/s)/(N/C).

What is the magnitude of the electric field in the solution?

E = 7.602 ✓ N/C

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5. 10/10 points | Previous Answers

Neutral block

Charged sphere

You place a neutral block of nickel near a small glass sphere which has a charge of 3e-08 coulombs uniformly distributed over its surface.

A) How long do you have to wait to make sure that the mobile electron sea inside the nickel block has reached equilibrium?

- ○ About 10 minutes
- ◉ Less than a nanosecond (1e-9 s)
- ○ Several hours
- ○ About 1 second

✓

B) In equilibrium, what is the drift speed of the mobile electrons inside the nickel?

- ◉ 0 m/s
- ○ About 1e5 m/s
- ○ About 1e-5 m/s

✓

C) In the equation $v = uE$, what is the meaning of the symbol u?

- ○ The density of mobile electrons inside the metal, in (electrons/m^3)
- ○ The time it takes a block of metal to reach equilibrium in seconds.
- ◉ The mobility of an electron inside the metal, in (m/s)/(N/C)

✓

D) This part of the question focuses on reasoning. Use these premises:

The definition of equilibrium (part B, above), and
The relationship between drift speed and electric field in a conductor (part C)

to reason about which situations are *possible* inside a nickel block at equilibrium.

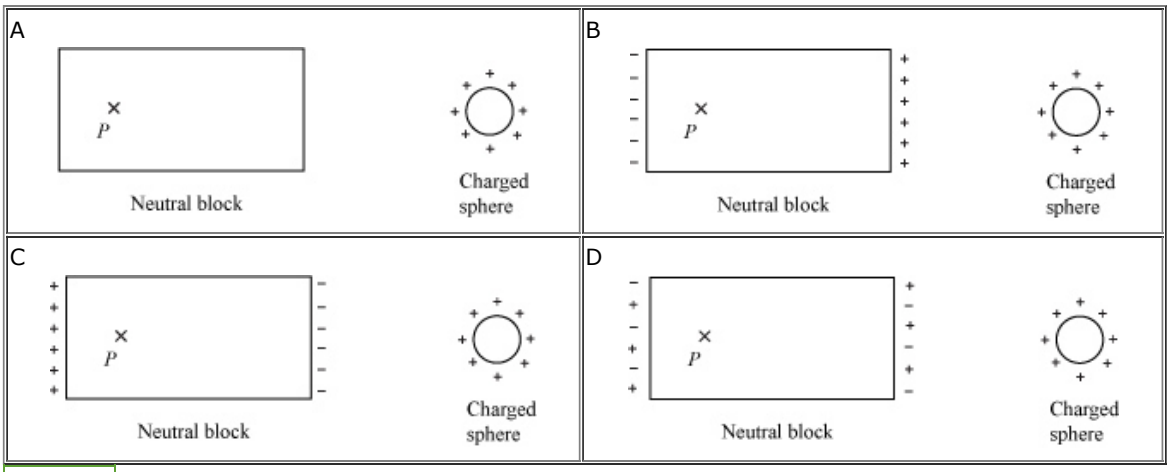
Hint: Some of the situations are possible, some are ruled out by one premise, and some are ruled out by two premises. If a situation is ruled out by two premises, check both boxes.

Case	Drift speed v	Net electric field E_{net}	At equilibrium: Possible or not?
1	v = 0	$E_{net} = 0$	☐ Not possible because v = uE ☐ Not possible by definition of equilibrium ☑ Possible ✓
2	v = 0	$E_{net} > 0$	☐ Not possible by definition of equilibrium ☑ Not possible because v = uE ☐ Possible ✓
3	v > 0	$E_{net} = 0$	☑ Not possible because v = uE ☐ Possible ☑ Not possible by definition of equilibrium ✓
4	v > 0	$E_{net} > 0$	☑ Not possible by definition of equilibrium ☐ Possible ☐ Not possible because v = uE ✓

E) Now that you have considered each case above, in equilibrium which one is the only possible situation?

- ○ 2
- ○ 3
- ○ 4
- ◉ 1 ✓

F) Which of the following schematic diagrams best represents the charge distribution on the neutral nickel block at equilibrium?



- (•) C
- ( ) B
- ( ) D
- ( ) A

G) At location *P* inside the nickel block the electric field due to the charged sphere is < -320, 0, 0 > N/C. At equilibrium, which of the following statements must be true, based on the reasoning in part D?

- ( ) The electric field at *P* due only to charges on the surface of the nickel block is < 0, 0, 0 > N/C.
- (•) Because the net field at *P* is 0, the electric field at *P* due only to charges on the surface of the polarized nickel block must be < 320, 0, 0 > N/C
- ( ) It is not possible to determine the electric field at *P* due only to charges on the surface of the nickel block.