

U of W Physics 122 Unit #1 Name _____

Last

First

Initial

CLOSED BOOK SHOW YOUR WORK

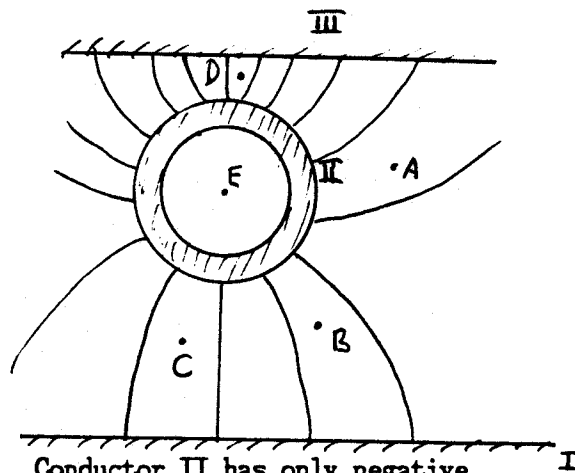
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Part I. The figure shows, in cross section, three pieces of copper which are electrically insulated from each other and from the ground. The lines represent electric field. The points labelled A through E and a dust particle with charge q and mass m are mentioned in some questions.

$$m = 1.3 \times 10^{-10} \text{ kilograms}$$

$$q = +5.1 \times 10^{-12} \text{ Coulombs}$$

Conductor I has only positive charge. Conductor II has only negative charge.

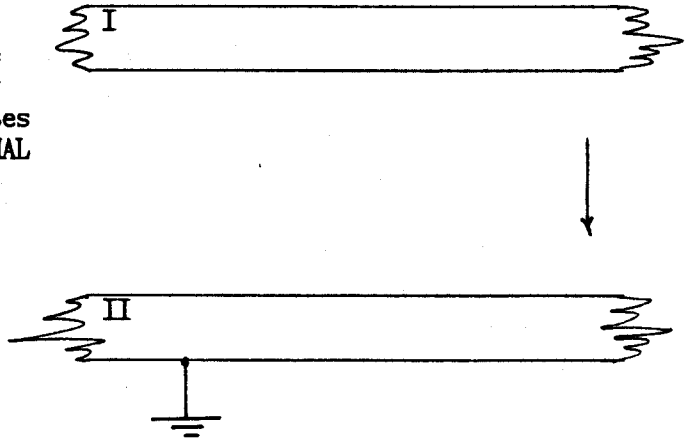


- (4) 1. Put an appropriate arrow head on each electric field line.
- (2) 2. At which labelled point (or points) is $E = 0$?
- (2) 3. At which one labelled point is $|E|$ greatest?
- (2) 4. If a proton is released at point A, which piece of copper, if any, will it hit?

Suppose the dust particle is at point B, where $|E| = 6800 \text{ N/C}$, and is moving toward point C.

- (2) 5. Draw an arrow, with its tail at point C, in the direction of the electric force on the dust particle.
- (2) 6. What is the dust particle's acceleration $|a|$? [In m/sec^2 .]
- (2) 7. At this instant, is the dust particle's speed increasing, decreasing, or not changing?

Part II. The figure shows, in cross section, two conducting plates I and II. One is grounded. The other is insulated and initially is uncharged. The arrow indicates the direction of the GRAVITATIONAL field. The plates are in a good vacuum.



Now a positively charged rod is rubbed against conductor II, then removed. Afterward,

- (2) 1. Does plate I have a positive, negative, or zero charge?
- (2) 2. Does plate II have a positive, negative, or zero charge?
- (2) 3. Is the electric field between the plates up, down, or zero?

Next, plate I is grounded momentarily, then insulated again. Then a positively charged rod is rubbed against plate I, then removed. Afterward,

- (2) 4. Does plate I have a positive, negative, or zero charge?
- (2) 5. Does plate II have a positive, negative, or zero charge?
- (2) 6. Is the electric field between the plates up, down, or zero?
- (2) 7. Now a positive point charge, travelling slowly horizontally toward the left enters the space between the plates exactly halfway between them. Will it hit I or II or will it pass through undeflected? [Gravity can be neglected here.]

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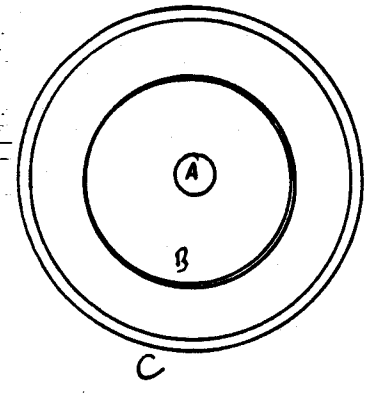
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U of W Physics 122 Unit #2 Name _____
Last First Initial

~~XXXXXXXXXX~~ SHOW YOUR WORK

~~PASS 05/00~~ Signature _____

Part I. The figure shows, in cross section, three concentric, spherical conductors A, B, and C. The electric flux through any surface enclosing sphere X (but not touching any larger sphere) is Φ_X . [Positive is radially outward from the center.] Point charge q is mentioned in some questions.



$$\Phi_A = - 100. \text{Nm}^2/\text{C}$$

$$\Phi_B = + 500. \text{Nm}^2/\text{C}$$

$$\Phi_C = - 300. \text{Nm}^2/\text{C}$$

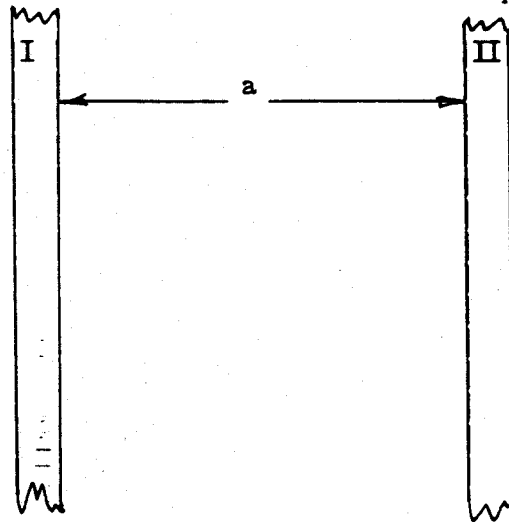
$$q = +7.6 \text{nC}$$

$$[1 \text{ nC} = 10^{-9} \text{ C}]$$

What is the electric charge on each of the following surfaces? [In nC.]

- (2) 1. The outside of A:
- (2) 2. The inside of B:
- (2) 3. The outside of B:
- (2) 4. The inside of C:
- (2) 5. The outside of C.
- (2) 6. What is the electric field |E| at r = 0.068 meters. [Outside C.] [In N/C.]
- (2) 7. What electric force |F| acts on q at r = 0.011 meters. [Between A and B.] [In Newtons.]
- (2) 8. What is the direction of q's acceleration at r = 0.054 meters. [Between B and C.]

Part II. The figure shows, in cross section, parallel conductors I and II, each with area A , separated by distance a . The electric flux density halfway between the conductors is E . The flux is toward the right. There is vacuum between the conductors.



$$|E| = 1300 \text{ N/C}$$

$$A = 0.630 \text{ m}^2$$

$$a = 0.025 \text{ m}$$

- (2) 1. Is the surface charge on I positive, negative, or zero?
- (2) 2. Is the surface charge on II positive, negative, or zero?
- (2) 3. What is the flux $|\Phi|$ from or to I? [In Nm^2/C .]
- (2) 4. What is the flux $|\Phi|$ from or to II? [In Nm^2/C .]
- (2) 5. What is the surface charge density $|\sigma|$ on I? [In nC/m^2 .]
- (2) 6. What is the surface charge density $|\sigma|$ on II? [In nC/m^2 .]
- (2) 7. A charged dust particle between the conductors initially is moving toward II, but does not reach it. Is the particle's charge positive or negative?