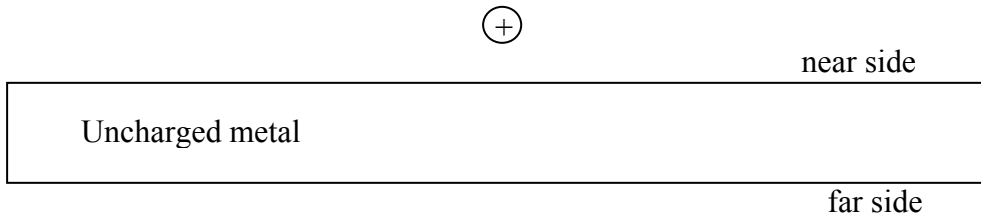


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Tuesday, September 15

### Quiz 3A

A positive point charge is brought near an uncharged metal slab as shown below.



- a. The charge on the near side of the slab is \_\_\_\_\_ *negative* \_\_\_\_\_  
(positive/negative/zero). Explain.

*The slab becomes polarized. Negative (positive) charge accumulates on the near (far) side because it is attracted (repelled) by the positive charge. The net charge on the slab remains zero.*

- b. The net electric force between the charge and the slab is \_\_\_\_\_ *attractive* \_\_\_\_\_  
(attractive/repulsive/zero). Explain.

*The attraction between the charge and the near side is stronger than the repulsion between the charge and the far side (because that side is further away), so the net result is an attraction.*

- c. If the point charge were negative, the force in part b would be \_\_\_\_\_ *attractive* \_\_\_\_\_  
(attractive/repulsive/zero). Explain.

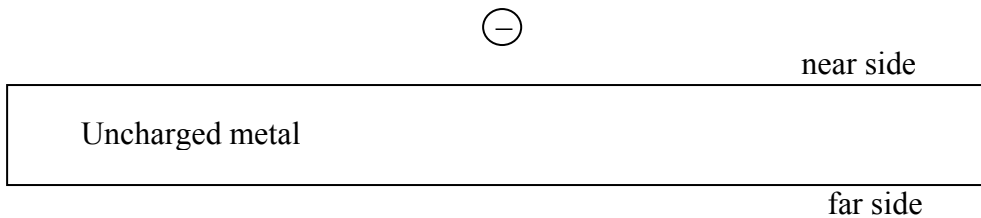
*The force would be attractive just the same. If the charge was negative, the polarization of the slab would be the opposite: positive charge on the near side, negative on the far side. So the attractive force from the near side would still be stronger than the repulsive force from the far side.*

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### Quiz 3B

A negative point charge is brought near an uncharged metal slab as shown below.



- a. The charge on the near side of the slab is \_\_\_\_\_ *positive* \_\_\_\_\_  
(positive/negative/zero). Explain.

*The slab becomes polarized. Positive (negative) charge accumulates on the near (far) side because it is attracted (repelled) by the negative charge. The net charge on the slab remains zero.*

- b. The net electric force between the charge and the slab is \_\_\_ *attractive* \_\_\_\_\_  
(attractive/repulsive/zero). Explain.

*The attraction between the charge and the near side is stronger than the repulsion between the charge and the far side (because that side is further away), so the net result is an attraction.*

- c. The far side of the slab is grounded, while the point charge remains in the same place. After this, the charge on the near side of the slab is \_\_\_ *positive* \_\_\_\_\_  
(positive/negative/zero). Explain.

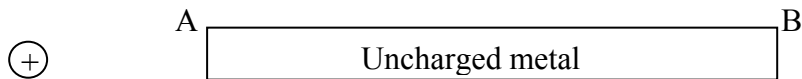
*Negative charges are repelled from the point charge. If the slab is grounded, this repulsion will push them out of the slab, so the far side –which was negative before the grounding– is now uncharged. But the near side is still positive, because these charges are attracted by the point charge, independently of the grounding.*

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### Quiz 3C

A positive point charge is brought near an uncharged metal bar as shown below. The ends of the bar are labeled A and B.



- a. The charge at B is \_\_\_\_\_ *positive* \_\_\_\_\_ (positive/negative/zero). Explain.

*Negative (positive) charge accumulates at A (B) because it is attracted (repelled) by the positive point charge. The net charge on the bar remains zero.*

- b. The net electric force between the point charge and the bar is \_\_\_\_\_ *attractive* \_\_\_\_\_ (attractive/repulsive/zero). Explain.

*The attraction between the charge and A is stronger than the repulsion between the charge and B (because that end is further away), so the net result is an attraction.*

- c. B is now grounded. After that, the charge at A is \_\_\_\_\_ *negative* \_\_\_\_\_ (positive/negative/zero). Explain.

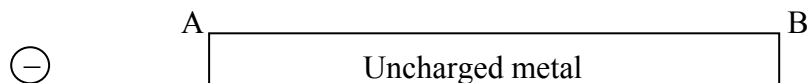
*Positive charges are repelled from the point charge. If the bar is grounded, this repulsion will push them out of the bar through the grounding wire, so B –that was positive before the grounding– is now uncharged. (In reality, it is negative charges entering the bar from the ground, since protons are not free to move, but the result is the same and might be easier to picture with positive charges).*

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### Quiz 3D

A negative point charge is brought near an uncharged metal bar as shown below. The ends of the bar are labeled A and B.



- a. The charge at B is \_\_\_\_\_ *negative* \_\_\_\_\_ (positive/negative/zero). Explain.

*Negative (positive) charge accumulates at B (A) because it is repelled (attracted) by the negative point charge. The net charge on the bar remains zero.*

- b. B is now grounded. After that, the charge at B is \_\_\_\_\_ *zero* \_\_\_\_\_ (positive/negative/zero). Explain.

*Negative charges are repelled from the point charge. If the bar is grounded, this repulsion will push them out of the bar through the grounding wire, so B –which was negative before the grounding- is now uncharged.*

- c. Then the grounding is removed, and after that the point charge is moved far from the bar. As a result of this process, the net charge on the bar is \_\_\_\_\_ *positive* \_\_\_\_\_ (positive/negative/zero). Explain.

*While the point charge is there, there is a positive charge accumulation at A because of the electric attraction. That is true even with the grounding. When the point charge is removed, these positive charges, which repel each other, will spread throughout the entire slab. (If grounding was still there, the positive charges would go to the ground. That is why it is important to remove the grounding first).*