Electric Fields Near Conductors Recall that many of the electrons in a conductor are free to move.As a result, charges in the clouds spark to the rod, rather than to another point on the building.Lightning rods If an electric field is strong enough, when the particles hit other molecules they will produce a stream of ions and electrons that form a plasma, which is a conductor.This field can become so strong that when electrons are knocked off of atoms, the electrons and resulting ions are accelerated by the field, causing them to strike other atoms, resulting in more ionization of atoms.Recall that potential difference is equal to the product of the electric field and distance, or AV = Ed. Because the potential difference between any two points inside the container is zero, the equation implies that the field is zero everywhere inside a closed, charged metal container.A car is a closed metal box that protects passengers from electric fields generated by lightning.Irregular surfaces The electric field at the surface does depend on the shape of the conductor, as well as on the electric potential difference between it and other objects.In order to protect buildings from lightning, builders install lightning rods.The excess charges move to the outer surface of the conductor.This chain reaction produces the pink glow seen inside a gas discharge sphere.Consider the charges on the conducting sphere in Figure 28.Because these electrons have like charges, they repel each other.It does not matter if the conducting sphere is solid or hollow.Closed metal containers What happens if a closed metal container, such as a box, is charged?You can use a voltmeter to measure the electric potential difference between any two points inside the container.What are the consequences of this measurement for the electric field inside of the closed, metal container?The field is always perpendicular to the surface of the conductor.This makes the surface an equipotential; the potential difference between any two locations on the surface is zero.Free charges are closer together at the sharp points of a conductor, as indicated in Figure 28.The result is a spark or, in extreme cases, lightning.

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