

We can summarise as follows the basic facts about electricity, all verifiable from simple experiments:

- An object can be made electric by friction. Some materials are easier to electrify than others.
- There are two types of electric charge: positive and negative.
- Like charges repel; opposite ones attract.
- The strength of the attractive or repulsive electric force between objects decreases with distance.
- The electric force is far more powerful than gravity. But like gravity, the electric force can act through empty space.
- The electric force an object is capable of exerting is independent of its mechanical properties – its shape, size, density, *etc.*

### **The atomic description of electricity**

Benjamin Franklin's terms of positive and negative charge were rooted in his idea that electricity was some form of 'subtle fluid', of which electrified materials had either too much (when positively charged) or too little (when negatively charged). A material which was not charged he called **electrically neutral** because it contained its proper amount of this mysterious fluid.

Franklin believed that all charged bodies sought to become electrically neutral – to **discharge** their surplus or remedy their deficiency of electric charge. This explained both why similarly charged bodies repelled one another and those with an opposite charge attracted.

For example, a body with a positive charge (having 'too much' electricity) tries to surrender its excess of charge to a negatively charged body (one with 'too little' electricity). Also, because two bodies with the same charge could not discharge to each other, they repelled one another.

### **Leaping sparks and lightning rods**

Franklin further suggested that if the charge on two oppositely charged bodies was large enough, the excess on one would leap or spark across to the other without the two bodies needing to be in physical contact. It was from this theory that he developed the idea that lightning in the atmosphere was simply the discharge of electricity from clouds to the earth, and for lightning to take place, the clouds had to carry a large electric charge opposite in sign to that of the area of earth beneath them.

It was known at the time that spark discharges were best attracted by metal rods with sharp points. Franklin recommended placing such rods (now called lightning conductors) on top of tall buildings, and connecting each one by a length of wire to another metal rod, driven into the ground. In this way, the electricity in the clouds would be discharged safely to the earth.