3-2 Note 1 Types of Electric Charge

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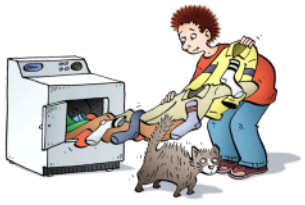
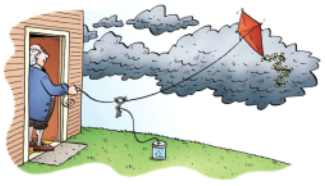
Science 9 Topic 3.2 How do electrical charges behave: - Concept 1 Types of Electric Charge

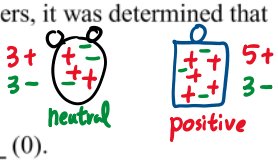


- The effects of static electricity are all around you
  - e.g. clothes from dryer, lightning, shocks from metal doors
- A **static charge** is an electric charge that is stationary (not moving).
- Eventually static charges are discharged, or lost, to other objects or to the air.
- The study of static electric charge is called electrostatics.
- We cannot see electric charge directly.
- Instead, we observe its effects
  - e.g. lighting is a discharge of static electricity

Types of Electric Charge

- Benjamin Franklin showed that lightning is a form of electricity by flying a kite during a thunderstorm.
- Because of experiments by Franklin and others, it was determined that there are two types of charges:
  - positive and negative.
- An object without any charge is neutral (0).





Atomic Structure and Electric Charge

- Recall from chemistry that all matter is made up of tiny particles called atom.
  - Three smaller (subatomic) particles make up the atom: proton ⊕, neutrons ✊ and electrons ⊖.
- Protons and neutrons are strongly attached to the nucleus but electrons are outside of the nucleus are can be easily added or removed.
- Therefore, whether an object develops a negative or positive charge is due to whether it gain (-) or loses (+) electrons.

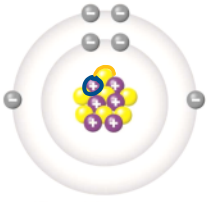
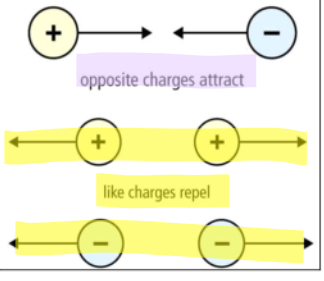


Figure 7.2 An atom

Laws of Electric Charges

- The law of electric charges states that "like charges repel and unlike charges attract"
- Two positive objects push away from each other
- Two negative objects push away from each other
- One positive and one negative will attract each other

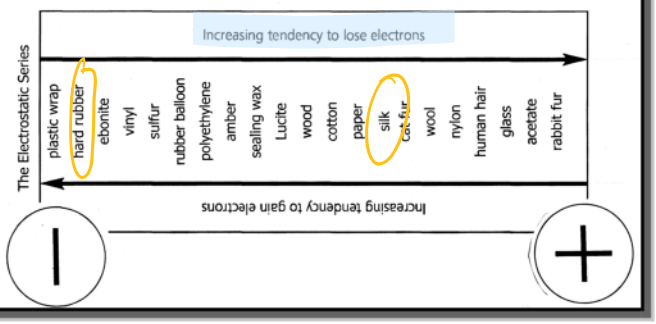


Electrostatic series table (not in the book)

- A list of materials in order of increasing attraction for electrons.
- It shows you which object is more likely to ___lose___ or ___gain___ electrons when two objects are rubbed against each other due to ___movement___ of electrons

hair (+) vs balloon (−)

lose electrons — gain electrons



Static Electric Charge Examples

- An amber rod develops a ___negative___ charge when rubbed with wool or fur.
- A plastic rod develops a ___positive___ charge when rubbed with cotton
- When objects are rubbed against each other, they can transfer charge from one to another
  - only ___electrons___ move around – not ___protons___
- Some materials are more likely than others to give up electrons.
  - Ex. When acetate (a type of plastic used in overhead transparencies) is rubbed with paper, the acetate develops a ___positive___ (+) charge and the paper develops a ___negative___ (−) charge.

  - Example: if rubber was rubbed with silk...silk is more likely to ___lose___ electrons so it would become ___positive___ charged, giving electrons to the rubber and making it ___negative___ charged.

Attraction of Neutral Objects to Charged Objects

◊ When a charged object is brought near to a ___neutral___ object, the electrons in the neutral object ___shift___ so that the end of the neutral object is ___attracted___ to the charged object.

◊ Although there is a slight shift of charges within the neutral object, it ___does not___ gain or lose electrons and is still neutral.

◊ This charging effect is known as **induced charge separation**.

Induced Charge Separation