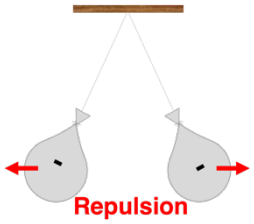
Charge Interactions
Video Notes

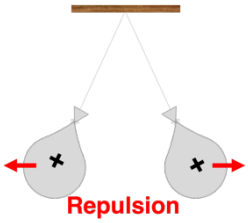
By observing interactions between charged objects and their surroundings, you can often predict the type of charge an object possesses. Doing so requires that you mix logical reasoning with an understanding of three simple rules of charge interactions.

Three Rules of Charge Interactions

1

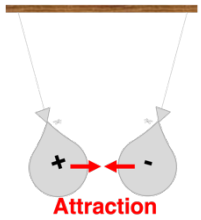
Like-charged objects repel each other.





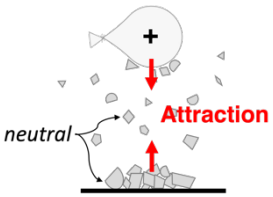
2

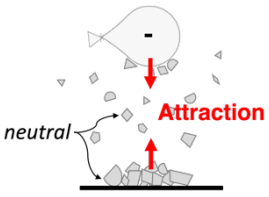
Oppositely-charged objects attract each other.



3

Any charged object (+ or -) and a neutral object attract each other.





Note that there are two reasons why two objects could attract:

1. They are both charged and charged oppositely, or
2. One object is charged (+ or -) and the other object is neutral.

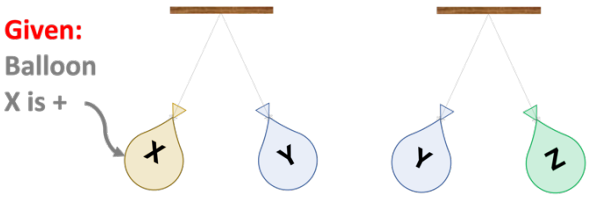
Thus, compared to observations of repulsion, observing two objects to attract reveals less conclusive evidence regarding its charged state.

Example 1

Observations: (1) Balloons X and Y repel.
(2) Balloons Y and Z repel.

Given: Balloon X is +.

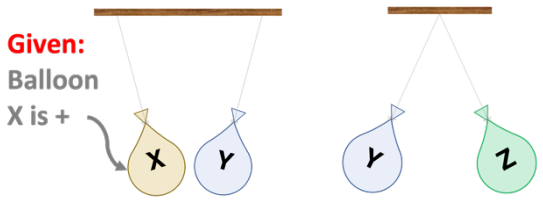
Question: What is the charge on balloon Y and balloon Z?



Logic: Y must have the same charge as X since they repel. **Y is positive**.
Z must have the same charge as Y since they repel. **Z is positive**.

Example 2

Observations: (1) Balloons X and Y attract.
(2) Balloons Y and Z repel.



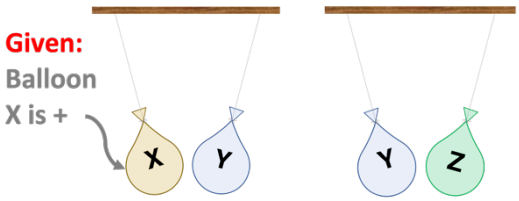
Given: Balloon X is +.

Question: What is the charge on balloon Y and balloon Z?

Logic: Based on the X-Y interaction, you would conclude that Y is either neutral (Rule 3) or negative (Rule 2). But also knowing that Y and Z repel, you can rule out the possibility of Y being neutral. **Y is negative**.
Z must have the same charge as Y since they repel. **Z is negative**.

Example 3

Observations: (1) Balloons X and Y attract.
(2) Balloons Y and Z attract.



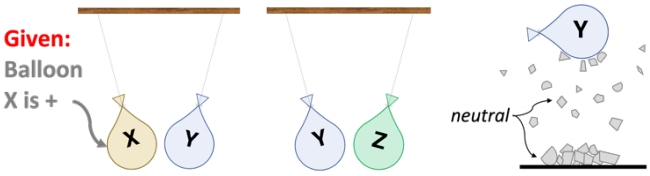
Given: Balloon X is +.

Question: What is the charge on balloon Y and balloon Z?

Logic: Both observations include attraction and attraction provides less conclusive evidence regarding the charged state of objects. Expect *inconclusiveness*.
Based on the X-Y interaction, you would conclude that Y is either neutral (Rule 3) or negative (Rule 2). Without any other observation to rule out either of these possibilities, you can conclude that **Y is either neutral or negative**.
The attraction between Z and Y could occur because Y is charged and Z is neutral (Rule 3) OR because Y is neutral and Z is charged either + or – (Rule 3) OR because Y is charged and Z is charged oppositely (Rule 2). Given the three possibilities, you can't conclude much about Z. **Z is either positive, negative, or neutral**.

Example 4

Observations: (1) Balloons X and Y attract.
(2) Balloons Y and Z attract.
(3) Balloon Y and neutral paper bits attract.



Given: Balloon X is +.

Question: What is the charge on balloon Y and balloon Z?

Logic: Based on the X-Y interaction, you would conclude that Y is either neutral (Rule 3) or negative (Rule 2). But since Y is attracting neutral paper bits, it can't be neutral. So **Y is negative**.
The attraction between Z and Y could occur because Y is charged and Z is neutral (Rule 3) OR because Z is charged positively, the opposite of Y (Rule 2). So you can conclude that **Z is either positive or neutral**.