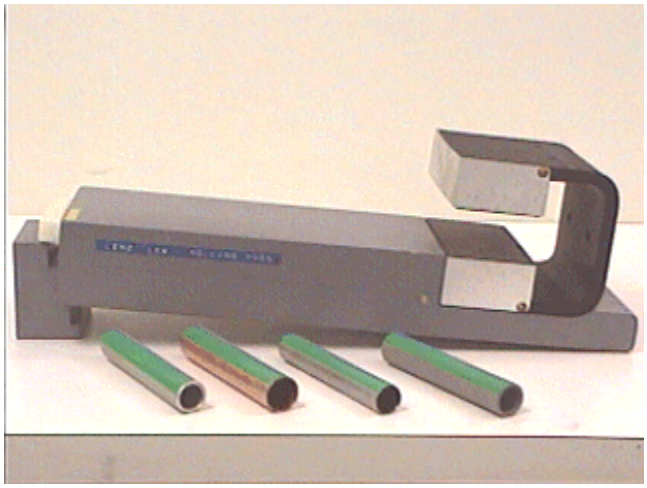
Answer #121



The answer is: plastic (fastest), aluminum=copper, iron (slowest), as can be seen in a series of videos by clicking your mouse on:

aluminum

copper

iron

plastic

It is clear that the plastic tube is the fastest. Because it is non-magnetic and non-metallic, it is unaffected by the magnetic field.

It is clear that the iron tube is the slowest. Because it is a magnetic material, it is attracted by the magnet, stops, and *never* gets past the pole tips.

Both the aluminum and the copper are metallic, so that as they pass through the magnetic field eddy currents are generated in the metal. According to Lenz's law, these eddy currents create magnetic fields that oppose the motion, so both slow down appreciably as they pass between the pole tips. The copper is a bit more conductive, so it should yield greater currents, stronger magnetic fields, and a greater force. However, copper is also heavier, so the copper tube is affected less by the force than a lighter aluminum tube might be. It appears that these two effects cancel, at least to the accuracy that can be observed in this experiment. (If you go frame-by-frame through each video, both the aluminum and the copper need ten frames to pass through the pole tips and drop off the lower edge.)

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For questions and comments regarding the *Question of the Week* contact Dr. Richard E. Berg by e-mail or using phone number or regular mail address given on the Lecture-Demonstration Home Page.