

4.14.1: Lecture Demonstration- Model Mass Spectrometer

Demonstrate a model mass spectrometer^[1] built by affixing a magnet to the bottom at the center of a ~60 x 20 cm plexiglas ramp. Roll ball bearings of different size (from BB to 1 cm) down the ramp, and observe different deflections depending on mass. The top of the ramp is ~2 cm higher than the bottom, and a small dimple is drilled in the plexiglas near the top as a starting point. The bottom may rest on collection trays for different deflections.

The differences between magnetic deflection of metal balls and charged particles should be emphasized: The force depends on the velocity and the charge for nuclei, and is in a direction determined by the right hand rule.

The radius of curvature is given by: $r = m \text{ (kg)} v \text{ (m/s)} / q \text{ (Coulombs)} B \text{ (Tesla)}$

Several simulations are available on the web, for example ^[2] and ^[3].

References

1. J. Chem. Educ., 1989, 66 (12), p 1039
2. [Chemistry DEMOS](http://www.colby.edu) [www.colby.edu]
3. www.oraxcel.com/projects/masssim/

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