Procedures for the Mass Spectrometry Demo for Challenge Days

Materials:

4 Standard Balls (Clear (water-ball), White (lacrosse), Red (bouncy ball), Yellow (golf))
1 Unknown ball (volley ball, keep hidden until you measure it)
Launcher
"Launch Pad" (a journal, this is to keep the balls elevated since some are smaller and need to be up a little)
"Detector" (Tape line ~21 feet from Launcher)
4 Stopwatches
Pre-made graph on easel with markers (one black, one non-black)

Before Beginning:

- Introduce Mass Spectrometry
- Explain the procedures (and safety) to the students, possibly show a demonstration.
- Assign 3 groups: Timers, Graphers, Launchers
    - Give time to explain procedures to each individual group (how to launch, how to time, how to record)

General Procedures:

1) Adult (grad student or mentor) loads the launcher (pull back the spring and load).
2) First launcher student places the select standard ball on the launchpad.
3) All timers stand near the detector, a single timer will then say 'Ready, Set, Go!'
4) On "Go!", the launcher student lifts up the eye pin which will launch the ball.
5) On "Go!" all of the Timers will start their watches.
6) Once the ball crosses the 'detector', Timers press 'Stop'
7) Graphers record all the times (round up to one decimal place for ease (3.7) to the assigned ball.
8) Graphers will then weigh the ball and plot the weight vs. time on the graph

Repeat steps 1-8 for all of the four standard balls (labeled clear, white, red and yellow). Help the students draw a 'calibration curve' on the graph.

Unknown Procedures:

1) Reveal the unknown to the group, ask them where they think the ball fits in comparison to the standard balls ("Which ball do you think the volleyball is closest to in mass?")
2) Launch the unknown same as the above procedures and collect the arrival times.
3) Have the students use the arrival time to figure out where the unknown fits on the calibration curve.
4) After they guess, weigh the unknown and see how close you are to the actual mass.

If there is extra time, feel free to let other students try out the launcher, do more standard launches and see the 'precision'.