Example Problem

In an amusement park ride, passengers stand inside a 5.0-m diameter hollow steel cylinder with their backs against the wall. The cylinder begins to rotate about a vertical axis. Then the floor on which the passengers are standing suddenly drops away. If all goes well, the passengers will "stick" to the wall and not slide down. Clothing has a static coefficient of friction between 0.60 and 1.0 and a kinetic coefficient between 0.40 and 0.70. A sign at the entrance says "No children under 30 kg allowed." What is the minimum speed for which the ride is safe to ride?

Example Problem

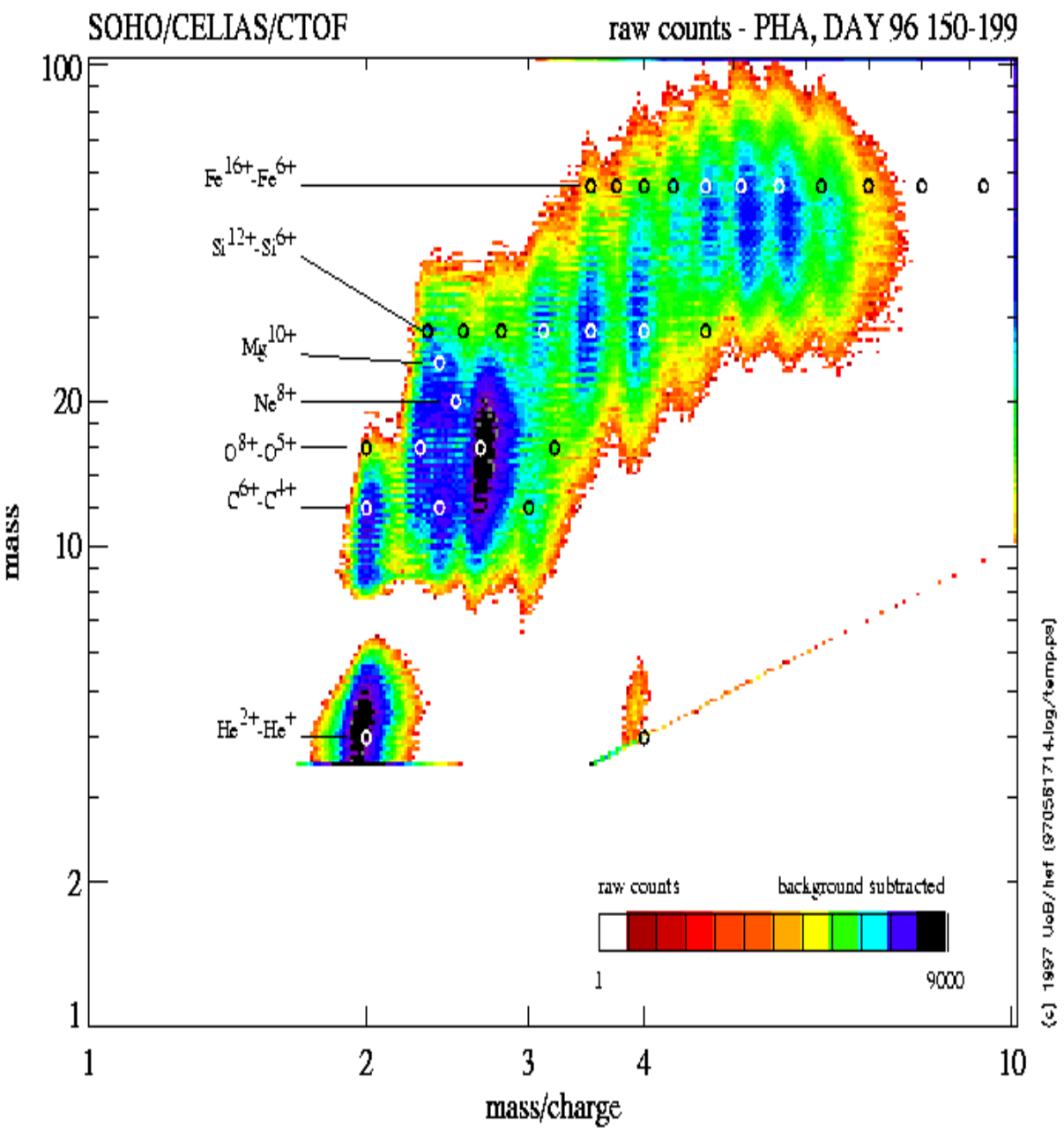
- A centrifuge is a common laboratory instrument that separates components of differing densities in solutions. This is accomplished by spinning a sample around in a circle with a large angular speed. Suppose that after a centrifuge is turned off, it continues to rotate with a constant angular acceleration for 10.2 s before coming to rest. (a) if its initial angular speed was 3850 rpm, what is the magnitude of its angular acceleration? (b) How many revolutions did the centrifuge complete after being turned off?

Kepler's Laws of Orbital Motion

- 1st Law - planets follow elliptical orbits with the Sun at one focus of the ellipse
- 2nd Law - the radius vector from the Sun to the planet sweeps out equal areas in equal time
- 3rd Law - the orbital period of a planet is proportional to the radius to the 3/2 power (derived for circular orbit – just replace r by a)

Example Problem

The Solar and Heliospheric Observatory (SOHO) spacecraft has a special orbit such that it always has a view of the Sun, but is close to the Earth. It moves in a nearly-circular orbit around the Sun that is smaller than the Earth's orbit. Its period is equal to 1 year! It is always located between the Sun and the Earth along a line joining them. Show that SOHO's distance from the Earth is between 1.47×10^9 m and 1.48×10^9 m. $M_S = 1.991 \times 10^{30}$ kg, $M_E = 5.983 \times 10^{24}$ kg, and $r_E = 1.496 \times 10^{11}$ m.



SOHO was launched Feb. 14, 1996.

See: http://sohowww.nascom.nasa.gov/