Sedimentation and Svedberg units

A laboratory ultracentrifuge.

A **svedberg** unit (symbol **S**, sometimes **Sv**) is a non-SI unit for sedimentation rate.
The sedimentation rate for a particle of a given size and shape measures how fast the particle 'settles', or sediments. It is often used to reflect the rate at which a molecule travels to the bottom of a test tube under the centrifugal force of a centrifuge. The svedberg is technically a measure of time, and is defined as exactly 10^{-13} seconds (100 fs).
The Svedberg unit (S) offers a measure of particle size based on its rate of travel in a tube subjected to high g-force.
The unit is named after the Swedish chemist Theodor Svedberg (1884–1971), winner of the 1926 Nobel Prize in chemistry for his work on disperse systems, colloids and his invention of the ultracentrifuge.
The Svedberg coefficient is a nonlinear function. It depends on the frictional forces retarding the particle's movement, which in turn are related to the average cross-sectional area of the particle.
That's why different factors determine the S value of a particle:

- Mass
- Density
- Shape.

A substance with a sedimentation coefficient of 26S (26×10^{-13} s) will travel at 26 micrometers per second (26×10^{-6} m/s) under the influence of an acceleration of a million gravities (10^7 m/s^2). Centrifugal acceleration is given as $r\omega^2$; where r is the radial distance from the rotation axis and ω is the angular velocity in radians per second.
Bigger particles tend to sediment faster and thus have higher Svedberg values.
Note that Svedberg units are not directly additive, since they represent a rate of sedimentation, not weight.

The Svedberg is the most important measure used to distinguish ribosomes. Ribosomes are composed of two complex subunits, each of which includes rRNA and protein components. In prokaryotes (bacteria), the subunits are named 30S and 50S for their "size" in Svedberg units. These subunits are made up of three forms of rRNA: 16S, 23S, and 5S.
For bacterial ribosomes, ultracentrifugation yields intact ribosomes (70S) as well as separated ribosomal subunits, the large subunit (50S) and the small subunit (30S). Within cells, ribosomes normally exist as a mixture of joined and separate subunits. The largest particles (whole ribosomes) sediment near the bottom of the tube, whereas the smaller particles (separate 50S and 30S subunits) appear in upper fractions.