**Cassini Mission Objectives**

The scientific objectives of the Cassini mission at Saturn were to investigate the physical, chemical, and temporal characteristics of Saturn (its atmosphere, rings, and magnetosphere), Titan and the Icy Satellites. A listing of the initial objectives follows:

**Atmosphere**

1. Determine the temperature field, cloud properties, and composition of the atmosphere of Saturn.

2. Measure the global wind field, including wave and eddy components; observe synoptic cloud features and processes.

3. Infer the internal structure and rotation of the deep atmosphere.

4. Study the diurnal variations and magnetic control of the ionosphere of Saturn.

5. Provide observational constraints (gas composition, isotope ratios, and heat flux, etc.) on scenarios for the formation and the evolution of Saturn.

6. Investigate the sources and the morphology of Saturn lightning, Saturn Electrostatic Discharges (SED), and whistlers.

**Rings**

1. Study the configuration of the rings and dynamical processes (gravitational, viscous, erosional, and electromagnetic) responsible for the ring structure.

2. Map the composition and size distribution of ring material.

3. Investigate the interrelation of rings and satellites, including embedded satellites.

4. Determine the dust and meteoroid distribution in the vicinity of the rings.

5. Study interactions between the rings and Saturn's magnetosphere, ionosphere, and atmosphere.

**Magnetosphere**

1. Determine the configuration of the nearly axially symmetric magnetic field and its relation to the modulation of Saturn Kilometric Radiation (SKR).

2. Determine current systems, composition, sources, and sinks of magnetosphere charged particles.

3. Investigate wave-particle interactions and dynamics of the dayside magnetosphere and the magnetotail of Saturn and their interactions with the solar wind, the satellites, and the rings.

4. Study the effect of Titan's interaction with the solar wind and magnetospheric plasma.

5. Investigate interactions of Titan's atmosphere and exosphere with the surrounding plasma.

**Titan**

1. Determine the abundance of atmospheric constituents (including any noble gases), establish isotope ratios for abundant elements and constrain scenarios of formation and evolution of Titan and its atmosphere.

2. Observe vertical and horizontal distributions of trace gases, search for more complex organic molecules, investigate energy sources for atmospheric chemistry, model the photochemistry of the stratosphere and study formation and composition of aerosols.

3. Measure winds and global temperatures; investigate cloud physics, general circulation, and seasonal effects in Titan's atmosphere; search for lightning discharges.

4. Determine the physical state, topography, and composition of the surface; infer the internal structure of the satellite.

5. Investigate the upper atmosphere, its ionization, and its role as a source of neutral and ionized material for magnetosphere of Saturn.

**Icy Satellites**

1. Determine the general characteristics and geological histories of the satellites.

2. Define the mechanisms of crustal and surface modifications, both external and internal.

3. Investigate the compositions and distributions of surface materials, particularly dark, organic rich materials and low melting point condensed volatiles.

4. Constrain models of the satellites' bulk compositions and internal structures.

5. Investigate interactions with the magnetosphere and ring systems and possible gas injections into the magnetosphere.