

Planets: Some relevant data and some guidance: The list of interesting facts may have some omissions ... this document is meant as a guide, not as a complete overview.

Planet	Mass (Earth =1)	Radius (Earth =1)	Density (g/cm ³)	Escape Speed (km/s)	Semi-major axis (A.U.)	Surface Temp. (Kelvin)
Mercury	0.055	0.38	5.43	4.2	0.39	100 to 700
Venus	0.82	0.95	5.24	10.4	0.72	730
Earth	1.00	1.00	5.52	11.2	1.00	290
Mars	0.11	0.53	3.93	5.0	1.52	180 to 270
Jupiter	317.8	11.21	1.33	60	5.20	124
Saturn	95.16	9.45	0.69	36	9.54	97
Uranus	14.54	4.01	1.27	21	19.19	58
Neptune	17.15	3.88	1.64	24	30.07	59
Pluto	0.0021	0.18	2.06	1.2	39.48	40 to 60

Mercury

- Very bright in sky, hard to see since it is so near Sun
- No atmosphere
- Very weak magnetic field
- Looks a lot like our moon extensive cratering
- Eccentric orbit ($e=0.21$), tilted at 7° to ecliptic plane
- Interesting synchronicity of rotational and orbital periods

Venus

- Extremely bright in sky, second only to Sun and Moon. Fairly near Sun in sky.
- Very similar to Earth in bulk structure
- Extremely dense, cloudy atmosphere, mainly CO_2 , with some corrosive gases
- Slow counter-rotation (period of rotation = -243 days)!
- Many active volcanoes: hot spot volcanism.
- Greenhouse effect...

Mars

- The red planet (from iron in soil) visible in night sky.
- Rotational period and tilt of axis almost the same as Earth
- Very thin CO_2 atmosphere. Role of Greenhouse effect.
- "Ice-caps" of solid CO_2 + water ice: vary with season as solid $\text{CO}_2 \rightarrow \text{CO}_2$ gas
- Much liquid water on surface in past. Water now frozen: ice-caps and permafrost
- Many ancient volcanoes: hot spot volcanism.

Earth

- The archetype of a large terrestrial planet
- Cross-section: core, mantle, crust
- Composition and differentiation, and the role of earthquakes
- Sources of heat; Cooling and plate tectonics.
- Relative lack of visible cratering and why....
- Evolution of an oxygen atmosphere. Greenhouse effect?
- Relatively strong planetary magnetic field, and its probable origins

Jupiter

- The archetype of a large Jovian planet
- Largest Jovian in solar system
- Rapid rotation: Once every 10 hours.
- Consists mainly of H₂ (86%) and He (14%). Probably has a relatively very small, highly compressed rocky/icy core
- Extremely strong magnetic field
- Many satellites, and small ring
- Belts and zones in atmosphere. Giant red spot. Role of interior heat in making these features.
- **The Galilean satellites:** Io, Europa, Ganymede and Callisto

Saturn

- Second largest jovian in solar system
- Spectacular ring system and structure: Cassini division, Encke Gap. Orbital resonances.
- Rapid rotation: Once every 10 hours.
- Consists mainly of H₂ and He. More differentiated than Jupiter.
- Strong magnetic field
- Many satellites

Uranus

- Smaller jovian, probably with a moderate sized, compressed icy core.
- Rotation axis “tipped on its side.”
- Unusual alignment of magnetic field.
- Nearly featureless surface. Little interior heat.
- Consists mainly of H₂ (83%) and He (15%), but significant methane (2-3%) causing bluish tint to atmosphere.
- Moderate ring system and quite a few moons
- Moderately strong magnetic field
- Discovery: Herschel, by chance.

Neptune

- Smaller jovian, probably with a moderate sized, compressed icy core.
- Unusual alignment of magnetic field.
- A few surface features; Great Dark Spot. Role of interior heat in making these features.
- Consists mainly of H₂ (83%) and He (15%), but significant methane (2-3%) causing bluish tint to atmosphere.
- Moderate ring system and quite a few moons. **Triton:** Interesting composition and orbit.
- Moderately strong magnetic field
- Discovery: Adams and Le Verrier via calculations based upon orbital deviations of Uranus..

Pluto/Charon

- Consist of Rock and “Ices.” Large “Ice Dwarfs.” Compare with Triton.
- Largest of many millions of icy objects outside the orbit of Neptune. Quaoar, Ixion, Varuna, 2004 DW, Demote Pluto from planethood?
- Both Pluto and Charon rotate synchronously with their orbits around each other.
- Eccentric orbit around Sun ($e = 0.25$). Comes inside Neptune’s orbit for a small part of each orbit. Never collides with Neptune because of synchronous orbit with Neptune.
- Discovery: Tombaugh, after a long search.