

Physical and Orbital Planetary Data

Planet	a[AU]	Period [yr]	Orbit v [km/s]	Eccen	Incl [deg]	Diam [km]	Earth Mass	ρ g/cm ³	Rot [dys]	Obliq. [deg]	Grav Earth	V_{esc} [km/s]	Albedo	#Moons
Mercury	0.387	0.240	47.9	0.206	7.00	4,878	0.055	5.43	58.6	0.0	0.38	4.3	0.56	0
Venus	0.723	0.615	35.0	0.007	3.39	12,104	0.820	5.24	-243.0	177.4	0.91	10.4	0.65	0
Earth	1.000	1.000	29.8	0.017	0.00	12,756	1.000	5.52	0.997	23.4	1.00	11.2	0.39	1
Mars	1.523	1.881	24.1	0.093	1.85	6,794	0.107	3.90	1.026	25.2	0.38	6.0	0.16	2
Jupiter	5.203	11.86	13.1	0.048	1.308	142,796	317.8	1.3	0.41	3.1	2.53	60	0.70	64
Saturn	9.538	29.46	9.6	0.056	2.488	120,000	94.3	0.7	0.43	2.6.7	1.07	36	0.75	60
Uranus	19.191	84.07	6.8	0.046	0.774	52,400	14.6	1.3	-0.65	9.7.9	0.92	21	0.90	27
Neptune	30.061	164.82	5.4	0.010	1.774	50,450	17.2	1.5	0.72	2.9	1.18	24	0.82	13
Pluto	39.507	248.6	4.7	0.248	17.15	2,390	0.1873	0.0021	1750	153.28	122.5	0.059	1.2	0.4-0.6

Useful Constants

Velocity of Light	c	2.998×10^{10} cm s ⁻¹	2.998×10^8 m s ⁻¹
Gravitational constant	G	6.673×10^{-8} dyne cm ² gm ⁻²	6.673×10^{-11} Nt m ² kg ⁻²
Planck's constant	h	6.626×10^{-27} erg s	6.626×10^{-34} J s
Boltzman constant	k	1.381×10^{-16} erg deg ⁻¹	1.381×10^{-23} J deg ⁻¹
Mass of hydrogen	m_H	1.673×10^{-24} gm	1.673×10^{-27} kg
Mass of electron	e^-	9.109×10^{-28} gm	9.109×10^{-31} kg
Stephan-Boltzmann constant	σ	5.670×10^{-16} erg deg ⁻¹	5.670×10^{-23} J deg ⁻¹
Astronomical Unit	AU	1.496×10^{13} cm	1.496×10^{11} m
Solar Radius	R_\odot	6.959×10^{10} cm	6.959×10^8 m
Solar Mass	M_\odot	1.989×10^{33} gm	1.989×10^{30} kg
Earth Mass	M_\oplus	5.973×10^{27} gm	5.973×10^{24} kg
Solar Luminosity	L_\odot	3.826×10^{33} erg sec ⁻¹	3.826×10^{26} J sec ⁻¹
Solar Constant	F_\odot		1.360×10^3 J m ⁻² s ⁻¹
Avogadro's Number	N_A		6.0221×10^{23} mole ⁻¹
Gas Constant	\mathcal{R}	8.3143×10^7 erg K ⁻¹ mole ⁻¹	8.3143×10^0 J K ⁻¹ mole ⁻¹

Planetary Satellite Data

	Mass [10 ²⁰ kg]	Radius [km]	ρ (kg/m ³)	P_v	a [10 ³ km]	a [R _{Planet}]	Orb Per [dys]	Rot Per [dy]	i [deg]	e
Earth Satellites										
Moon	734.9	1738.1	3350	0.12	384.4	60.3	27.32	S	18.3-28.6	0.0549
Mars Satellites										
Phobos	1.06×10^{-4}	11.2	1900	0.07	9.378	2.76	0.318	S	1.08	0.015
Deimos	2.4×10^{-5}	6.1	1750	0.08	23459	6.92	1.262	S	1.79	0.0005

Planetary Satellite Data – Jovian System

	Mass [10^{20} kg]	Radius [km]	ρ (kg/m^3)	P_v	a [10^3 km]	a [$R_{Pl_{an.}}$]	Orb Per [dys]	Rot Per [dy]	i [deg]	e
Galilean Satellites										
Io (JI)	893.2	1821.6	3530	0.62	421.6	5.91	1.769138	S	0.04	0.004
Europa (JII)	480	1560.8	3010	0.68	670.9	9.4	3.551181	S	0.47	0.0101
Ganymede (JIII)	1481.9	2631.2	1940	0.44	1070.4	14.97	7.154553	S	0.21	0.0015
Callisto (JIV)	1075.9	2410.3	1830	0.19	1882.7	26.33	16.689018	S	0.51	0.007
Lesser Jovian Satellites										
Metis (JXVI, S/1979 J3)	0.001	20		0.06	128	1.79	0.294779	S	0.06	0.0002
Adrastea (JXV, S/1979 J1)	0.0002	$13 \times 10 \times 8$		0.1	129	1.8	0.29826	S	0.03	0.0015
Amalthea (JV)	0.075	$131 \times 73 \times 67$	3100	0.09	181.4	2.54	0.498179	S	0.4	0.003
Thebe (JXIV, S/1979 J2)	0.008	55×45		0.05	221.9	3.11	0.6745		0.8	0.018
Themisto (JXVIII, S/1975 J1)		4		0.04	7507	105	130.02		45.67	0.242
Leda (JXIII)	0.00006	5		0.07	11170	156.2	240.92		27.47	0.164
Himalia (JVI)	0.095	85		0.03	11460	160.3	250.5662	0.4	27.63	0.162
Lysithea (JX)	0.0008	12		0.06	11720	163.9	259.22		27.35	0.112
Elara (JVII)	0.008	40		0.03	11740	164.2	259.6528	0.5	24.77	0.217
S/2000 J11		2		0.04	12560	175.7	287		28.3	0.248
Carpis (XLVI, S/2003 J20)		3			16990	237.6	456.1		51.4	0.43
Euporie (JXXXIV, S/2001 J10)		1			19390	271.2	553.1R		147	0.156
Orthosie (JXXXV, S/2001 J9)		1			20720	289.8	622.6R		145.9	0.281
Euanthe (JXXXIII, S/2001 J7)		1.5			20800	290.9	620.6R		148.9	0.232
Thyone (JXXIX, S/2001 J2)		2			20940	292.9	627.3R		148.5	0.229
Mneme (JXL, S/2003 J21)		2			21070	294.7	620.0R		148.6	0.227
Harpalyke (JXXII, S/2000 J5)		2.2		0.04	21110	295.3	623.3R		148.7	0.227
Hermippe (JXXX, S/2001 J3)		2			21130	295.6	633.9R		150.7	0.21
Praxidike (JXXVII, S/2000 J7)		3.4		0.04	21150	295.8	625.3R		148.7	0.22
Thelxinoe (XLI, S/2003 J22)		2			21160	296	628.1R		151.4	0.221
Helike (XLV, S/2003 J6)		4			21260	297.4	634.8R		154.8	0.156
Iocaste (JXXIV, S/2000 J3)		2.6		0.04	21270	297.5	631.5R		159.7	0.218
Ananke (JXII)	0.0004	10		0.06	21280	297.7	629.8R		148.9	0.244
Eurydome (JXXXII, S/2001 J4)		1.5			22870	319.9	717.3R		150.3	0.276
Arche (XLIII, S/2002 J1)		1.5			22930	320.7	723.9R		165	0.259
Autonoe (JXXVIII, S/2001 J1)		2			23040	322.3	762.7R		152.9	0.334

Planetary Satellite Data – Jovian System (contd.)

	Mass [10^{20} kg]	Radius [km]	ρ (kg/m^3)	P_v	a [10^3 km]	a [$R_{Plan.}$]	Orb Per [dys]	Rot Per [dy]	i [deg]	e
Pasithee (JXXXVIII, S/2001 J6)		1			23100	323.1	716.3R		165.4	0.288
Chaldene (JXXI, S/2000 J10)		1.9		0.04	23180	324.2	723.8R		165.4	0.238
Kale (JXXXVII, S/2001 J8)		1			23220	324.8	729.5R		165	0.26
Isonoe (JXXVI, S/2000 J6)		1.9		0.04	23220	324.8	725.5R		165	0.261
Aitne (JXXXI, S/2001 J11)		1.5			23230	324.9	730.2R		165.1	0.264
Erinome (JXXV, S/2000 J4)		1.6		0.04	23280	325.6	728.3R		164.9	0.27
Taygete (JXX, S/2000 J9)		2.5		0.04	23360	326.7	732.2R		165.2	0.251
Carme (JXI)	0.001	15		0.06	23400	327.3	734.2R		164.9	0.253
Sponde (JXXXVI, S/2001 J5)		1			23490	328.6	748.3R		151	0.312
Kalyke (JXXIII, S/2000 J2)		2.6		0.04	23580	329.8	743.0R		165.2	0.243
Pasiphae (JVIII)	0.003	18		0.1	23620	330.4	743.6R		151.4	0.409
Eukelade (XLVII, S/2003 J1)		4			23660	330.9	746.4R		165.5	0.272
Megaclite (JXIX, S/2000 J8)		2.7		0.04	23810	333	752.8R		152.8	0.421
Sinope (JIX)	0.0008	14		0.05	23940	334.9	758.9R		158.1	0.25
Hegemone (JXXXIX, S/2003 J8)		3			23950	335	739.6R		155.2	0.328
Aoede (XLI, S/2003 J7)		4			23980	335.4	761.5R		158.3	0.432
Kallichore (XLIV, S/2003 J11)		2			24040	336.3	764.7R		165.5	0.264
Callirrhoe (JXVII, S/1999 J1)		4		0.04	24100	337.1	758.8R		147.1	0.283
Cyllene (XLVIII, S/2003 J13)		2			24350	340.6	737.8R		149.3	0.319
Kore (XLIX, S/2003 J14)		2			24540	343.3	779.2R		152.4	0.325
Unnamed Jovian Satellites										
S/2003 J2		2			28570	399.6	982.5R		151.8	0.38
S/2003 J3		2			18340	256.5	504.0R		143.7	0.241
S/2003 J4		2			23260	325.4	723.2R		144.9	0.204
S/2003 J5		4			24080	336.8	759.7R		165	0.21
S/2003 J9		1			22440	313.9	683.0R		164.5	0.269
S/2003 J10		2			24250	339.2	767.0R		164.1	0.214
S/2003 J12		1			19000	265.8	533.3R		145.8	0.376
S/2003 J15		2			22000	307.7	668.4R		140.8	0.11
S/2003 J16		2			21000	293.7	595.4R		148.6	0.27
S/2003 J17		2			22000	307.7	690.3R		163.7	0.19
S/2003 J18		2			20700	289.5	606.3R		146.5	0.119
S/2003 J19		2			22800	318.9	701.3R		162.9	0.334
S/2003 J23		2			24060	336.5	759.7R		149.2	0.309

Planetary Satellite Data – Saturnian System

	Mass [10^{20} kg]	Radius [km]	ρ (kg/m^3)	P_v	a [10^3 km]	a [$R_{Plam.}$]	Orb Per [dys]	Rot Per [dy]	i [deg]	e
Major Saturnian Satellites										
Mimas (SI)	0.379	209×196×191	1150	0.6	185.52	3.0783	0.9424218	S	1.53	0.0202
Enceladus (SII)	1.08	256×247×245	1610	1	238.02	3.9494	1.370218	S	0	0.0045
Tethys (SIII)	6.18	536×528×526	960	0.8	294.66	4.8892	1.887802	S	1.86	0
Dione (SIV)	11	560	1470	0.7	377.4	6.262	2.736915	S	0.02	0.0022
Rhea (SV)	23.1	764	1230	0.7	527.04	8.7449	4.5175	S	0.35	0.001
Titan (SVI)	1345.5	2,575	1880	0.22	1,221.83	20.273	15.945421	S	0.33	0.0292
Hyperion (SVII)	0.055	185×140×113	570	0.3	1,481.10	24.575	21.276609	C	0.43	0.1042
Iapetus (SVIII)	18.1	718	1090	0.05/0.5	3,561.30	59.091	79.330183	S	14.72	0.0283
Lesser Saturnian Satellites										
Pan (SXVIII, S/1981 S13)	0.00005	13	560	0.5	133.583	2.2165	0.575		0	0
Daphnis (SXXXV, S/2005 S1)		3			136.5	2.26	0.594		0	0
Atlas (SXV, S/1980 S28)	0.00002	18.5×17.2×13.5	500	0.8	137.67	2.282	0.6019		0.3	0
Prometheus (SXXVI, S/1980 S27)	0.0019	74×50×34	440	0.5	139.353	2.2843	0.613		0	0.0024
Pandora (SXXVII, S/1980 S26)	0.0015	55×44×31	530	0.7	141.7	2.3512	0.6285		0	0.0042
Epimetheus (SXI, S/1980 S3)	0.0053	69×55×55	630	0.8	151.422	2.5099	0.6942	S	0.34	0.009
Janus (SX, S/1980 S1)	0.019	97×95×77	610	0.9	151.472	2.5125	0.6945	S	0.14	0.007
Methone (SXXXII, S/2004 S1)		3			194	3.22	1.01			
Anthe (XLIX, S/2007 S4)		1			197.7	3.28	1.04		0.1	0.001
Pallene (SXXXIII, S/2004 S2)		4			211	3.5	1.14			
Calypso (SXIV, S/1980 S25)	0.00004	15×8×8	1000	1	294.66	4.8892	1.8878		1.473	0.001
Telesto (SXIII, S/1980 S13)	0.00007	15×12.5×7.5	1000	1	294.66	4.8892	1.8878		1.158	0.001
Helene (SXII, S/1980 S6)	0.0003	18×16×15	1500	0.7	377.4	6.262	2.7369		0	0.005
Polydeuces (SXXXIV, S/2004 S5)		4			377.4	6.26	2.74			
Kiviuq (SXXIV, S/2000 S5)		7		0.06	11,370	189	449		48.7	0.334
Ijiraq (SXXXII, S/2000 S6)		5		0.06	11,440	190	451		49.1	0.316
Phoebe (SIX)	0.083	115×110×105	1630	0.08	12,944	215	548	0.4 R	174.8	0.164
Paaliaq (SXX, S/2000 S2)		10		0.06	15,200	252	687		47.2	0.364
Skathi (SXXVII, S/2000 S8)		3		0.06	15,650	260	729	R	148.5	0.27
Albiorix (SXXXVI, S/2000 S11)		13		0.06	16,390	272	738		34	0.469
Bebhionn (SXXXVII, S/2004 S11)		3			17,120	284	835		35	0.469
Erriapo (SXXXVIII, S/2000 S10)		4		0.06	17,340	288	871		34.6	0.474

Planetary Satellite Data – Saturnian System (contd.)

	Mass [10^{20} kg]	Radius [km]	ρ (kg/m^3)	P_v	a [10^3 km]	a [R_{Plam}]	Orb Per [dys]	Rot Per [dy]	i [deg]	e
Siarnaq (SXXIX, S/2000 S3)		16		0.06	17,530	291	896		45.6	0.295
Skoll (XLVII, S/2006 S8)		3			17,670	293	878	R	161.2	0.464
Tarvos (SXXI, S/2000 S4)		7		0.06	17,980	298	926		33.8	0.531
Tarqeq (SLII, S/2007 S1)		3			18,010	299	888		46.1	0.16
Greip (SLI, S/2006 S4)		3			18,210	302	921	R	179.8	0.326
Hyrrokkin (SXLIV, S/2004 S19)		4			18,440	306	932	R	151.4	0.333
Mundilfari (SXXV, S/2000 S9)		3		0.06	18,710	310	951	R	169.4	0.21
Jarnsaxa (SL, S/2006 S6)		3			18,810	312	965	R	163.3	0.216
Narvi (SXXXI, S/2003 S1)		3		0.06	19,010	315	1004	R	145.8	0.431
Bergelmir (XXXVIII, S/2004 S15)		3			19,340	321	1006	R	158.5	0.142
Suttungr (SXXXIII, S/2000 S12)		3		0.06	19,470	323	1017	R	175.8	0.114
Hati (XLIII, S/2004 S14)		3			19,860	330	1039	R	165.8	0.372
Bestla (SXXXIX, S/2004 S18)		3			20,130	334	1084	R	145.2	0.521
Farbauti (SXL, S/2004 S9)		3			20,390	338	1086	R	156.4	0.206
Thrymr (SXXX, S/2000 S7)		3		0.06	20,470	340	1089	R	175	0.47
Aegir (SXXXVI, S/2004 S10)		3			20,740	344	1017	R	166.7	0.252
Kari (SXLV, S/2006 S2)		3			22,120	367	1234	R	156.3	0.478
Fenrir (SXLI, S/2004 S16)		2			22,450	373	1260	R	164.9	0.136
Surtur (SXLVIII, S/2006 S7)		3			22,710	377	1298	R	177.5	0.451
Loge (SXLVI, S/2006 S5)		3			23,040	383	1312	R	173.1	0.335
Ymir (SXIX, S/2000 S1)		9		0.06	23,070	383	1313	R	167.9	0.187
Fornjot (SXLII, S/2004 S8)		3			25,110	417	1491	R	170.4	0.206
Unnamed Saturnian Satellites										
S/2004 S07		3			19,800	329	1103	R	165.1	0.58
S/2004 S12		3			19,650	326	1048	R	164	0.401
S/2004 S13		3			18,450	306	906	R	167.4	0.273
S/2004 S17		2			18,600	309	986	R	166.6	0.259
S/2006 S1		3			18,980	315	970	R	154.2	0.13
S/2006 S3		3			21,130	351	1142	R	150.8	0.471
S/2007 S2		3			16,560	275	800	R	176.7	0.218
S/2007 S3		3			20,520	340	1100	R	177.2	0.13

Planetary Satellite Data – Uranian System

	Mass [10^{20} kg]	Radius [km]	ρ (kg/m^3)	P_v	a [10^3 km]	a [$R_{Plan.}$]	Orb Per [dys]	Rot Per [dy]	i [deg]	e
Major Uranian Satellites										
Miranda (UV)	0.66	$240 \times 234.2 \times 232.9$	1200	0.27	129.39	5.078	1.413479 S	4	22.0	27
Ariel (UI)	13.5	$581.1 \times 577.9 \times 577.7$	1670	0.35	191.02	7.481	2.520379 S	0	31.0	34
Umbriel (UII)	11.7	584.7	1,400	0.19	266.3	10.41	4.144177 S	0	36.0	50
Titania (UIII)	35.2	788.9	1,710	0.28	435.91	17.05	8.705872 S	0	14.0	22
Oberon (UIV)	30.1	761.4	1,630	0.25	583.52	22.79	13.463239 S	0	10.0	8
Lesser Uranian Satellites										
Cordelia (UVI, S/1986 U7)		20		0.07	49.77	1.947	0.335034		0.08	0.0003
Ophelia (UVII, S/1986 U8)		21		0.07	53.79	2.104	0.3764		0.1	0.0099
Bianca (UVIII, S/1986 U9)		26		0.07	59.17	2.315	0.434579		0.19	0.0009
Cressida (UIX, S/1986 U3)		40		0.07	61.78	2.417	0.46357		0.01	0.0004
Desdemona (UX, S/1986 U6)		32		0.07	62.68	2.452	0.47365		0.11	0.0001
Juliet (UXI, S/1986 U2)		47		0.07	64.35	2.518	0.493065		0.07	0.0007
Portia (UXII, S/1986 U1)		68		0.07	66.09	2.586	0.513196		0.06	0
Rosalind (UXIII, S/1986 U4)		36		0.07	69.94	2.736	0.55846		0.28	0.0001
Cupid (S/2003 U2)		5			74.8	2.93	0.618			
Belinda (UXIV, S/1986 U5)		40		0.07	75.26	2.944	0.623527		0.03	0.0001
Perdita (XXV, S/1986 U10)		10		0.07	76.4	2.99	0.638			
Puck (UXV, S/1985 U1)		81		0.07	86.01	3.365	0.761833		0.3	0.0001
Mab (S/2003 U1)		5			97.7	3.82	0.923			
Francisco (XXII, S/2001 U3)		11			4276	167.3	266.6	R	145.2	146
Caliban (UXVI, S/1997 U1)		36		0.07	7230	282.9	579.5	R	140.9	159
Stephano (UXX, S/1999 U2)		16		0.07	8002	313.1	676.5	R	141.1	230
Trinculo (UXXI, S/2001 U1)		9			8571	335.3	758.1	R	166.3	208
Sycorax (UXVII, S/1997 U2)		75		0.07	12179	476.5	1283.4	R	159.4	522
Margaret (UXXIII, S/2003 U3)		10			14345	561.3	1694.8		56.6	661
Prospero (UXVIII, S/1999 U3)		25		0.07	16418	642.4	1992.8	R	151.9	443
Setebos (UXIX, S/1999 U1)		24		0.07	17459	683.1	2202.3	R	158.2	588
Ferdinand (XXIV, S/2001 U2)		10			20900	817.7	2823.4	R	169.8	368

Planetary Satellite Data – Neptunian System, Pluto

	Mass [10^{20} kg]	Radius [km]	ρ (kg/m^3)	P_v	a [10^3 km]	a [R_{Plon}]	Orb Per [dys]	Rot Per [dy]	i [deg]	e
Neptune Satellites										
Naiad (NIII)	0.002	$48 \times 30 \times 26$		0.07	48.227	1.948	0.294396		4.74	0.0003
Thalassa (NIV)	0.004	$54 \times 50 \times 26$		0.09	50.075	2.022	0.311485		0.21	0.0002
Despina (NV)	0.02	$90 \times 74 \times 64$		0.09	52.526	2.121	0.334655		0.07	0.0001
Galatea (NVI)	0.04	$102 \times 92 \times 72$		0.08	61.953	2.502	0.428745		0.05	0.0001
Larissa (NVII)	0.05	$08 \times 102 \times 84$		0.09	73.548	2.97	0.554654		0.2	0.0014
Proteus (NVIII)	0.5	$20 \times 208 \times 202$		0.1	117.647	4.751	1.122315		0.04	0.0004
Triton (NI)	214	$1,353.40$	2,050	0.76	354.76	14.328	5.876854	RS	157.345	0.000016
Nereid (NII)	0.3	170		0.16	5513.4	222.67	360.13619		7.23	0.7512
Halimede (NIX, S/2002 N1)	0.001	30		0.16	15730	635.2	1879.7		134.1	0.571
Sao (NXI, S/2002 N2)	0.001	20		0.16	22420	905.3	2914.1		48.5	0.293
Laomedeia (NXII, S/2002 N3)	0.001	20		0.16	23570	951.8	3167.9		34.7	0.424
Neso (NXIII, S/2002 N4)		30			48390	1954	9374	R	132.6	0.495
Psamathe (NX, S/2003 N1)	0.0002	20		0.16	46700	1885.8	9115.9	R	137.4	0.45
Pluto Satellites										
Charon	16.2	593	1850	0.38	19.3	16.4	6.387	S	0	0

Notes: R = retrograde motion, S = synchronous rotation where the rotation period equals the orbital period, C = chaotic rotation.

Triple Points of Volatiles

Volatile	T[K]	P [bar]	Volatile	T[K]	P [bar]
C ₂ H ₆	305	50	Ar	83.8	0.679
H ₂ O	273.16	0.006	N ₂	63.2	0.12
CO ₂	216.6	5.1	O ₂	54.4	0.001
NH ₃	195.5	0.06	Ne	24.5	0.427
CH ₄	90.7	0.117	H ₂	13.8	0.076

Habitable Zones Around Stars

Star Type	T [K]	Inside Edge [AU]	Outside Edge [AU]	Star Type	T [K]	Inside Edge [AU]	Outside Edge [AU]
O	35000	115	215	G	6000	0.9	1.6
B	21000	40	75	K	4700	0.7	1.2
A	10000	5	10	M	3300	0.1	0.2
F	7200	2	3.7				