

Lesson 8 - The Jovian Planets

READING ASSIGNMENT

- Chapter 11.1: Orbital and Physical Properties
- Chapter 11.3: Internal Structure
 - Discovery 11-1: Almost a Star?
- Chapter 11.4: Jupiter’s Magnetosphere
- Chapter 11.2: The Atmosphere of Jupiter
 - Discovery 11-1: A Cometary Impact
- Chapter 11.5: The Moons of Jupiter
- Chapter 11.6: Jupiter’s Ring
- Chapter 12.1: Orbital and Physical Properties
- Chapter 12.3: Saturn’s Interior and Magnetosphere
- Chapter 12.2: Saturn’s Atmosphere
- Chapter 12.4: Saturn’s Spectacular Ring System
- Chapter 12.5: The Moons of Saturn
 - Discovery 12-1: Dancing Among Saturn’s Moons
- Chapter 13.2: Orbital and Physical Properties
- Chapter 13.4: Magnetospheres and Internal Structure
- Chapter 13.3: The Atmosphere’s of Uranus and Neptune
- Chapter 13.5: The Moon Systems of Uranus and Neptune
- Chapter 13.6: The Rings of the Outermost Jovian Planets

SUMMARY OF JOVIAN PLANET PHYSICAL DATA

Planet	Equatorial Radius (Earth = 1)	Mass (Earth = 1)	Average Density (kg/m³)	Surface Gravity (Earth = 1)	Escape Speed (km/s)
Jupiter	11.21	317.8	1330	2.53	60
Saturn	9.45	95.16	690	1.07	36
Uranus	4.01	14.54	1270	0.91	21
Neptune	3.88	17.15	1640	1.14	24

Table 1

Planet	Sidereal Period (solar days)	Axial Tilt (degrees)	Surface Magnetic Field (Earth = 1)	Albedo	Greatest Angular Diameter as Seen from Earth (arcseconds)
Jupiter	0.41	3.08	13.89	0.34	50
Saturn	0.44	26.73	0.67	0.34	21
Uranus	-0.72	82.08	0.74	0.30	4.1
Neptune	0.67	29.6	0.43	0.29	2.4

Table 2

SUMMARY OF MAJOR MOON PHYSICAL DATA

Planet	Moon	Equatorial Radius (Earth = 1)	Mass (Earth = 1)	Average Density (kg/m ³)	Surface Gravity (Earth = 1)	Escape Speed (km/s)
Jupiter	Io	0.29	0.015	3500	0.18	2.55
	Europa	0.25	0.008	3000	0.13	2.00
	Ganymede	0.41	0.025	1900	0.15	2.77
	Callisto	0.38	0.018	1900	0.13	2.44
Saturn	Titan	0.4	0.023	1900	0.14	2.69
Neptune	Triton	0.21	0.0036	2100	0.082	1.47

Table 3

SUMMARY OF FIVE MOST ABUNDANT ELEMENTS

Element	Symbol	Atomic Weight	Abundance	Most Common Molecular Form	Symbol	Molecular Weight
Hydrogen	H	1	92.67%	Hydrogen	H ₂	2
Helium	He	4	7.17%	Helium	He	4
Carbon	C	12	0.05%	Methane	CH ₄	16
Nitrogen	N	14	0.01%	Ammonia	NH ₃	17
Oxygen	O	16	0.08%	Water	H ₂ O	18

Table 4

MATH NOTES

Roche Limit

Read Chapter 12.4.

- If a moon gets too close to a planet, it will be torn apart by tidal forces. The debris will then form a ring around the planet. If the moon is held together by gravity and its density is similar to that of the planet, this occurs at a distance of $2.4 \times$ the radius of the planet. This distance is called the Roche limit.

- If the moon is held together by inter-atomic (electromagnetic) forces, as many small (<10 km in diameter) moons and asteroids are, or if its density is greater than that of the planet, its Roche limit is closer to the planet than 2.4 planetary radii.

Additional Notes

- There are no additional math notes for Lesson 8: This material is more qualitative.
- However, in Homework 8, you will apply Lesson 6's math notes¹ as you compare the Jovian planets to the terrestrial planets.

HOMEWORK 8

Download Homework 8 from WebAssign. Feel free to work on these questions together. Then submit your answers to WebAssign individually. Please do not wait until the last minute to submit your answers and please confirm that WebAssign actually received all of your answers before logging off.

¹../lab_6/manual.html#mathnotes