Astronomy 104 Study Guide
Unit 2: *The Science Surrounding Astronomy*

Lesson 1- *"Good Vibrations"*

Terms

Doppler Effect	electromagnetic waves	frequency
Kirchhoff's laws	medium	wave
wavelength	Wiens law	

Concepts and Ideas

1. What are the characteristics of waves?

2. What are the measurables for waves?

3. What are the different types of waves?

4. How are electromagnetic waves unique?

5. Describe the different parts of the EM spectrum.

6. All the different types of EM waves are fundamentally the same.

7. How are color and frequency related?

8. Explain of Wien's law, Kirchhoff's laws and the Doppler Effect can be used to obtain information from light.

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Lesson 2- *"Eye on the Sky"*

Terms

aperture	concave	catadioptric
convex	compound telescope	radio telescope
reflector	refractor	resolution
VLA		

Concepts and Ideas

1. What are the three purpose for a telescope? What features determine different aspects of telescope performance?

2. What are the different basic telescope designs? How do they compare with each other?

3. How is magnification calculated? What are the limits to magnification?

4. What is the significance of the Hubble Space Telescope. the Keck telescope and the VLA?

5. How do radio telescopes compare to optical ones?

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Lesson 3- *"What Goes Up and What Goes Down"*

Terms

acceleration	action	escape velocity
free fall	inertia	net force
orbit	orbital velocity	reaction
relative motion	universal law	

Concepts and Ideas

1. How is the term Law used in science?

2. What does it mean to say that motion is relative?

3. How are mass and inertia related?

4. How is velocity different from acceleration?

5. What are the three Laws of Motion? Explain common situations in terms of these laws.

6. How is action and reaction used in Newton's Third law?

7. What is a reaction engine? What does it "push" against?

8. Why do many rockets use stages?

9. What is Newton's view of gravity?

10. What determines the force of gravity on an object?

11. How does one object orbit another? What is the most important aspect of reaching an maintaining orbit?

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Lesson 4- *"Going Places"*

Terms

Command/Service Module	Direct Ascent	Earth Orbit Rendezvous
flyby	gravity assist	lander
Lunar Module	Lunar Orbit rendezvous	Saturn 5
Sputnik	Mars Direct	CEV
Spaceship 1	Kliper	

Hohman transfer orbit- This is the lowest energy (or lowest delta-v) orbit to move a spacecraft from one world to another.

delta-v- This is the velocity needed to reach a certain goal in space. Delta-v, rather than distance, determines the difficulty of reaching a world. See table below.

From	To	Delta-v in m/s
Earth Surface	Low Earth Orbit	9700
Low Earth Orbit	Lunar Orbit	4000
Low Earth Orbit	Low Mars Orbit	4500 to 7800*
Lunar Orbit	Lunar Surface	1600
Low Mars Orbit	Mars Surface	0 to 4100*
Mars Surface	Low Mars Orbit	4100

**The range of values indicate how aerobraking could reduce delta-v needed*

Concepts and Ideas

1. Why did Germany sponsor so much original rocket research before and during World War II? Why did the United States and the Soviet Union continue this research after World War II?

2. How did the Soviet Union take an early lead in space exploration? How did this lead to the Space Race and the drive to the Moon?

3. What were the various methods of reaching the Moon examined during the Space Race? What were the advantages and disadvantages of the different methods?

6. What is Lunar Orbit Rendezvous? What advantages caused it to be chosen for the US and Soviet Moon program? What was the fate to the Russian Manned Lunar program?

7. What are the various methods used to explore space beyond the Earth?

8. Describe the CEV, Kliper Mars Direct and Spaceship1.