ASTRONOMY 150 – FINAL Name: _____

March 19, 2003 – Winter 2003 TA's Name & Section: _____

Answer all questions in the space provided. If you have any questions, raise your hand. 100 points possible. No calculators.

We have samples in our collection of meteorites from many locations. For each of the locations listed below, name the type of **meteorite** that originates there (2 pts) and describe its physical characteristics (density and appearance) (4 pts).

1 (6 pts) The cores of differentiated asteroids.

2 (6 pts) Lava flows from the surface of asteroids.

3 (6 pts) The interiors of undifferentiated asteroids.

4 (3 pts) Why did I say that the giant planets Jupiter and Saturn are more like stars than terrestrial planets.

(a) Unlike any terrestrial planets, Jupiter and Saturn have magnetic fields that are generated in their interiors.
(b) Like stars, Jupiter and Saturn have long-lived atmospheric storms.
(c) Unlike the terrestrial planets, Jupiter and Saturn are impacted mainly by comets.
(d) Like stars, Jupiter and Saturn are big balls of gas composed primarily of hydrogen and helium.
(e) Like most stars, Jupiter and Saturn are in retrograde orbits.

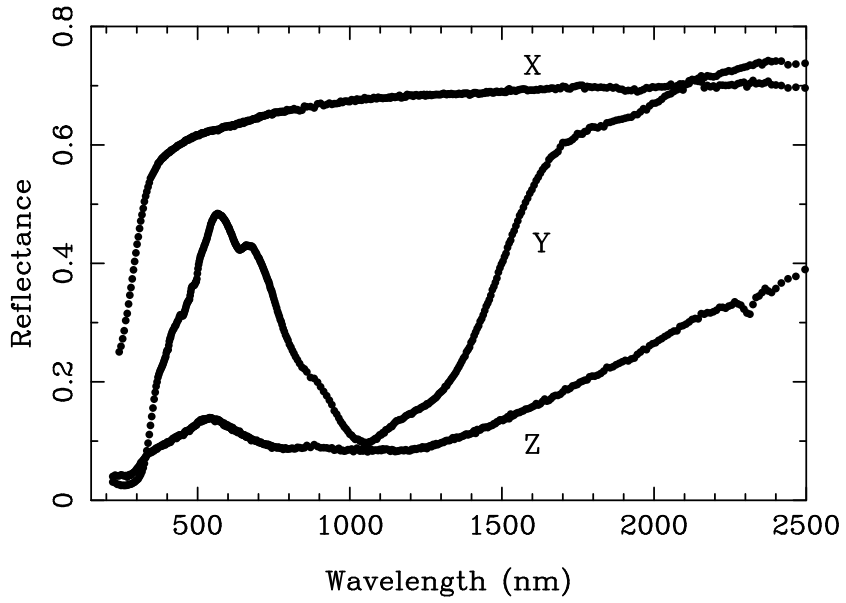
5 (6 pts) Explain why it is *very* difficult to detect Earth-sized planets around other stars.

6 (6 pts) Describe why secondary atmospheres in the outer parts of the solar system (*i.e.,* Titan) are different from secondary atmospheres in the inner solar system (*i.e.,* Venus).

7 (3 pts) What is the energy source that drove the geological activity on the surface of the Earth's Moon.

8 (6 pts) The Uranian satellite Ariel is about 1/3 the size of the Earth's Moon, but has a surface that appears much younger. Explain why this is.

9 (6 pts) Explain why the Earth's Moon does **not** undergo tidal heating.



On the left is a plot of the reflectance spectra of three different rock types (X, Y, AND Z). Human eyes are sensitive to light of wavelengths between 400 nm (Blue) and 800 nm (Red).

10 (6 pts) On the plot above, indicate the ultraviolet (UV), visible (Vis), and infra-red (IR) parts of the spectrum.

11 (5 pts) We have seen basalt on many surfaces in our solar system. Describe what basalt looks like.

12 (5 pts) Which of the rocks in the plot above is basalt? ◯ X ◯ Y ◯ Z
Explain your answer.

13 (2 pts) At what wavelength is the contrast between rock **X** and rock **Y** the greatest?

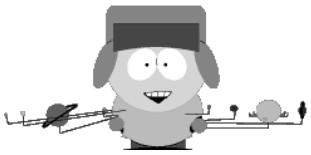
14 (4 pts) Explain what it means for an asteroid to be "in resonance with Jupiter."

15 (6 pts) I said that the asteroid belt can be thought of as a planet that never formed. Explain how we know the asteroid belt was never a *single large* planet.

16 (6 pts) I said that the rings of Saturn can be thought of as a moon that never formed. Explain why Saturn has a ring within 2.5 planetary radii and not a large moon.

"A geophysicist discovers that an unknown force has caused the Earth's inner core to stop rotating. With the planet's magnetic field rapidly deteriorating, our atmosphere literally starts to come apart at the seams with catastrophic consequences. To resolve the crisis, a team of the world's most gifted scientists, travel into the Earth's core in a subterranean craft. Their mission: detonate a device that will reactivate the core."

17 (10 pts) The quote above comes from the press release from the movie *The Core*. Pick one sentence from the quote and explain in detail why it may not be based on a firm understanding of planetary science.



18 (5 pts) I have said many times that "the Sun is the top 99 objects in the Solar system." Obviously, the Sun is only one object. Explain what I meant by this statement.