ASTRONOMY 150 – FINAL Name: _____

December 10, 2008 – Autumn 2008 TA's Name & Section: _____

**Answer all questions in the space provided. If you have any questions, raise your hand. 100 points possible. No calculators or electronic devices of any type.**

**1** (8 pts) Explain why Saturn's rings have regions with very few particles (*i.e.* gaps).

**2** (8 pts) Explain how we can determine how far an extrasolar planet is from its star, even though we can not see the planet.

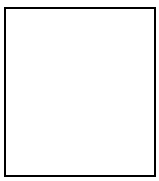
**3** (10 pts) In the space below, draw and label the reflectance spectra of the surface of a typical dead satellite in the outer solar system, and the surface of the Earth's Moon. You will have two different spectra on a single plot.

**4** (6 pts) Describe the typical density and amount of volatile material on the surface of a small world (diameter $< 200$ km) formed at a distance of:

0.3 AU

3.0 AU

30.0 AU

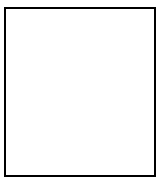


**5** (8 pts) I have said that you can **not** use crater counting to determine the ages of the worlds in the outer solar system. Describe what the evidence is that supports this statement.

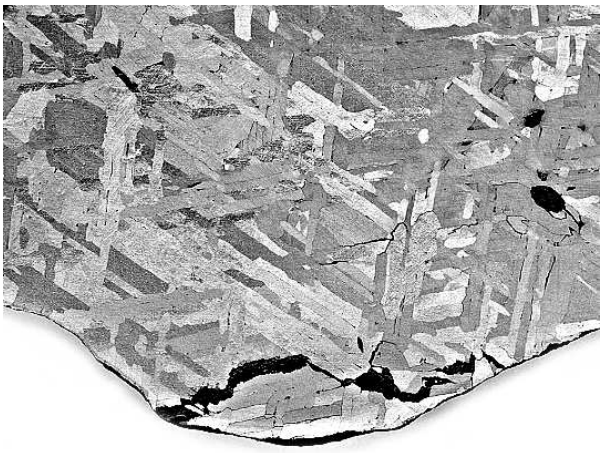
**6** (8 pts) Venus, Earth, Mars, and Titan are terrestrial worlds with **secondary** atmospheres. What is a secondary atmosphere, and why are they called secondary?

**7** (8 pts) Tidal forces play a critical role in tidal heating and the formation of rings. Explain what a tidal force is. [Do **not** explain tidal heating or ring formation, if you do you will loose points!]

**8** (8 pts) Explain why accretion is not very efficient in the very outer regions ($> 30$ AU) of the solar system.



**9** (6 pts) On the right is an image of a slice of a meteorite. Identify the meteorite and describe the characteristics of this slice that identifies it.



**10** (4 pts) Is this sample *primitive*? Explain.

**11** (8 pts) Describe the approximate **size**, **shape**, **density**, and **moment-of-inertia** of the *parent body* of this sample.

**12** (8 pts) For the following worlds, what are **oldest** and **youngest** rock samples you would expect to find on their surfaces? Be quantitative (*i.e.* X billion/million/thousand years old).

**Tidally heated satellite**: Oldest:_____ Youngest:_____

**Dead satellite**: Oldest:_____ Youngest:_____

**Earth**: Oldest:_____ Youngest:_____

**Typical asteroid**: Oldest:_____ Youngest:_____

**13** (8 pts) Explain how we can tell that most objects in the asteroid belt are small just by looking at the surface of the Earth's Moon.

**14** (2 pts) And finally, list the top 100 objects in the solar system.