ASTRONOMY 150 – FINAL Name: _____

December 13, 2006 – Autumn 2006 TA's Name & Section: _____

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

1 (5 pts) Number the following extra-terrestrial samples from oldest (1) to youngest (5).

_____ Rock from Io

_____ Iron Meteorite

_____ Carbonaceous Chondrite Meteorite

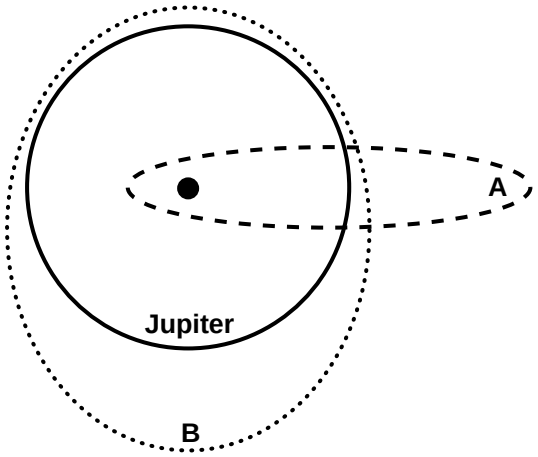
_____ Basalt from the Moon

_____ Ordinary Chondrite Meteorite

2 (10 pts) Explain why a carbonaceous chondrite meteorite parent body would never be spherical.

3 (2 pts) Why is the composition of secondary atmospheres different in the inner solar system as compared to the outer solar system?

(a) There is more H and He in the outer solar system.
(b) The outer worlds are being tidally heated.
(c) CO_2 is only a solid in outer solar system, not a gas.
(d) The outer worlds are made of ice as opposed to rock.
(e) The late heavy bombardment stripped light gasses from the inner worlds.



4 (15 pts) The drawing on the left shows the orbits of two comets (A and B) along with the orbit of Jupiter. Describe the appearance (amount of activity and size of tails) of each comet over one of its orbits about the Sun and also describe what the comets would look like 1 **billion** years from now. Assume that the comets *do not* interact with Jupiter.

5 (2 pts) The Roche limit for Saturn lies:

(a) at the orbit of Titan
(b) at the largest gap in Saturn's rings
(c) near the inner edge of the rings
(d) near the outer edge of the rings
(e) just beyond the orbit of the outermost satellite

6 (15 pts) Explain why we can **not** use crater counting to determine the absolute age of the surfaces of the moons of Saturn.

7 (2 pts) The Widmanstätten patterns of iron meteorites tell us that iron meteorites:

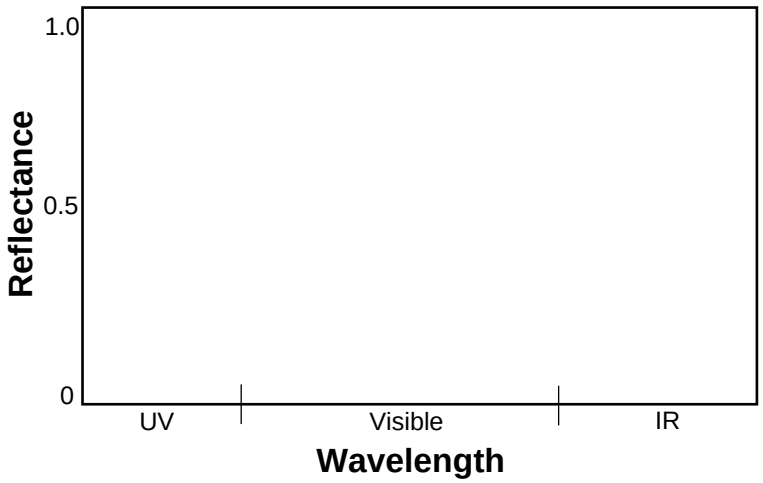
(a) Formed in the inner solar system.
(b) Formed on the surfaces of small bodies.
(c) Formed in very cold environments.
(d) Formed in the cores of large bodies.
(e) Formed on the surfaces of geologically active bodies.

8 (15 pts) Saturn's moon Enceladus is only about 1/7 the size of the Earth's moon. The tidal heating of Enceladus leads to active volcanoes and regions of its surface are hot enough to melt. Explain how the surface can be melting even though the maximum temperature on Enceladus is only about -300 F. Also, explain why the volcanic geysers on Enceladus throw material to even greater altitudes than the geysers on Jupiter's volcanic moon Io.

9 (2 pts) A solar-type star in another galaxy, in some other part of the universe, has a 8 Jupiter-mass planet orbiting it at a distance of 1.0 AU. The size (diameter) of this planet is:

(a) about 8 times the size of Jupiter
(b) about 64 times the size of Jupiter
(c) about 1/8 the size of Jupiter
(d) about the same size as Jupiter
(e) about the same size as Earth

10 (15 pts) Explain why it is very difficult to detect Earth-sized extra-solar planets far from their central star using the radial velocity method (this was the method used to discover 51 Peg).



11 (3 pts) On the graph on the left, sketch the reflectance spectra of the piece of paper you are currently looking at.

12 (12 pts) Assume that the Sun will remain unchanged over the next 10 billion years. Describe what the surface of the Earth, Jupiter's moon Io, and Neptune's moon Triton will look like 10 billion years from now.

13 (2 pts) And finally, list the top 100 objects in the solar system.