ASTRONOMY 150 – FINAL Name: _____

December 17, 2002 – Autumn 2002 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** (3 pts) What does it mean for a world to be *differentiated*?

(a) The northern hemisphere is different from the southern hemisphere.
(b) There are more small impact craters and large ones.
(c) The magnetic field is not centered on the axis of rotation.
(d) A high density core is surrounded by a lower density mantle and crust.
(e) The leading side through space is more heavily cratered than the trailing side

**2** (5 pts) There are at least a million asteroids in the asteroid belt. Explain why the Voyager spacecraft survived its trip through the asteroid belt undamaged.

**3** (8 pts) Venus and Earth are the same size, made of the same materials, and have about the same level of geological activity. Earth has a magnetic field, Venus does not. Explain why Venus does not have a magnetic field.

The Earth's Moon and Saturn's moon Titan are about the same size, have about the same gravity, and were both formed out of the same reservoir of materials. However, they are two **VERY** different worlds.

**4** (8 pts) Explain why the Moon is mostly composed of rock ($\rho = 3.4$ g/cm$^3$), while Titan is mostly composed of ice ($\rho = 1.9$ g/cm$^3$).

**5** (8 pts) Explain why Titan would be geologically active longer than the Moon. [No, it has nothing to do with tidal heating].

**6** (6 pts) Explain why Titan can hold on to an atmosphere and the Moon can not.

**7** (10 pts) If the Moon had an atmosphere (even for a short time) that atmosphere would be very different in composition from Titan's. Explain why this is, and what its composition would be.

Meteorites that arrive on the Earth have three main sources: the Moon, Mars, and the asteroid belt. For each of the three sources, describe how the materials get from there to the surface of the Earth.

**8** (3 pts) The Moon

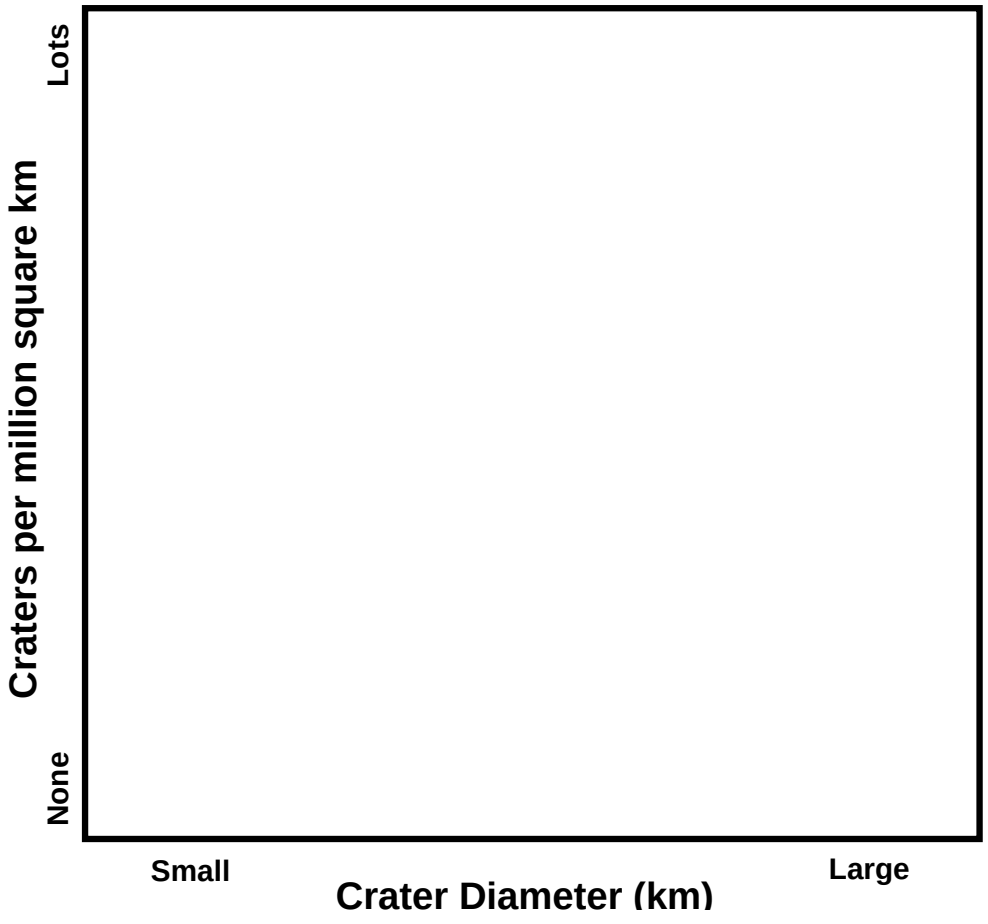
**9** (3 pts) Mars

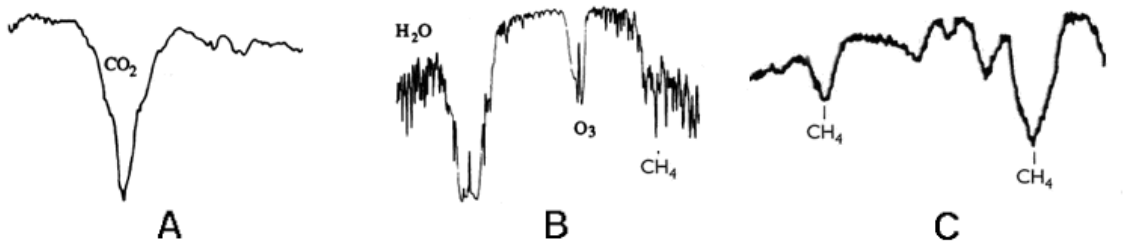
**10** (6 pts) the asteroid belt

**11** (4 pts) Which of these three sources would be the **most unlikely** place to find primitive materials?

**12** (5 pts) Explain why most planetary ring systems do not extend much beyond the *Roche limit* of a planet.

**13** (12 pts) On the graph below, sketch and label the surface crater density of Jupiter's four large moons Callisto, Ganymede, Europa, and Io.






**14** (7 pts) The graph above shows the spectra of the atmospheres of three terrestrial worlds. Which of the worlds would most likely have life on the surface (2 pts)? Explain your answer (5 pts).

**15** (5 pts) Describe the characteristics of "51 Peg" type extra-solar planetary systems.

**16** (2 pts) And finally, list the top 100 objects in the solar system.