ASTRONOMY 150 – MIDTERM Name: _____

April 26, 2007 – Spring 2007 TA's Name & Section (2 pts): _____

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.

You have discovered a new world orbiting the Sun at a distance of 1.9 AU. This planet is one third (1/3) the size of the Earth, and one ninth (1/9) as massive. The escape velocity is about one half (1/2) the escape velocity of the Earth.

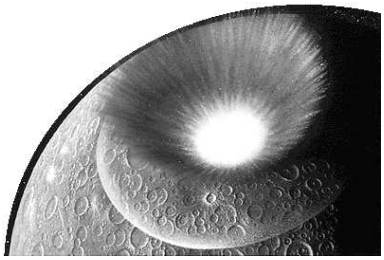
1 (4 pts) How does the gravity of this planet compare to the Earth's gravity? [Be quantitative; show your work.]

2 (4 pts) How would the level of geological activity on this world compare to the Earth's? Explain your answer.

3 (8 pts) Explain your educated *qualitative* guess as to the temperature (hot/warm/cold) and pressure (high/low/none) on the surface of this world.

4 (8 pts) The Moon has a moment-of-inertia factor of about 0.4 and a density of about 3 g/cm^3. Explain why this is unusual compared to the other inner solar system worlds.

5 (8 pts) Explain why the fission theory of Lunar origin does a nice job of explaining both of the above properties of the Moon (density and moment of inertia).



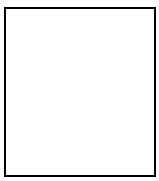
6 (10 pts) The **Caloris Basin** is a very large (> 2000 km) impact basin on the surface on Mercury. Without knowing anything else about it, correctly estimate the age of the Caloris Basin (be quantitative) and explain how you determined the age.

7 (8 pts) Explain why the level of geological activity on **all** worlds in the inner solar system decreases over time.

8 (5 pts) Explain how pristine highland-like rocks (Anorthosite) forms.

9 (5 pts) Explain why Anorthosite is very rare on the current surface of the Earth or Venus.

10 (5 pts) Explain why most of the Anorthosite samples collected on the Moon by the Apollo missions were collected near the **rims** of impact craters.



11 (8 pts) In the space below, sketch and label the **crater density plot** of the current surface of Venus and the highlands of the Moon. Plot both on the same graph. Make sure you label the axes.

12 (6 pts) Explain why there are very few simple impact craters on the current surface of the Earth or Venus.

13 (6 pts) Explain why there are no large impact basins on the current surface of the Earth or Venus.

14 (8 pts) Volcanoes on Mars are much higher than their Earth counterparts. But even on Mars, there is a limit to how high you can build mountains. Explain why there is this limit.

15 (5 pts) Assume you have omnipotent powers. Describe two physical properties of Mars that you would change so that it could have a livable (to Earth-like life) environment.