ASTRONOMY 150 – MIDTERM Name: _____

April 28, 2005 – Spring 2005 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.

0 (3 pts) Water has a density of _____ g/cm^3, rocks have a density of about _____ g/cm^3, and Iron has a density of about _____ g/cm^3.

1 (6 pts) We have seen basalt on the surface of the Moon, Mars and Venus. Assume that you can collect samples of the basalts from the three worlds. Explain how and why the ages of three samples would differ.

2 (6 pts) All of the Apollo missions explored simple impact craters. Explain how simple impact craters are used to sample the deep layers of the Moon.

The table below shows the properties of three planets orbiting a star that is identical to our Sun. Assume these planets are made of the same materials as the planets in our solar system. Use these data to answer the questions on this page.

Planet	Mass [Earth = 1]	Radius [Earth = 1]	Uncompressed Density [g/cm^3]	Moment-of-Inertia Factor [K]
Olga	1/6	2/3	3.2	0.40
Masha	?	1/2	4.0	0.35
Irina	2	?	5.0	0.30

3 (5 pts) What is the most likely composition of the planet Olga?

4 (5 pts) If the gravity on Masha is the **same** as the Earth's, what is the mass of the planet? [show your work]

5 (5 pts) If the gravity on Irina is the **twice** that of the Earth, what is the size of the planet? [show your work]

6 (5 pts) Which one of these worlds would have the most Iron in its **outer crust**? [Be sure to explain your answer]

7 (4 pts) Currently, the planet Mercury has no atmosphere. However, when it was geologically active, it released gasses. What gasses would have been released?

8 (6 pts) Explain why Mercury did not hold on to its atmosphere even though its escape velocity is nearly the same as Mars'.

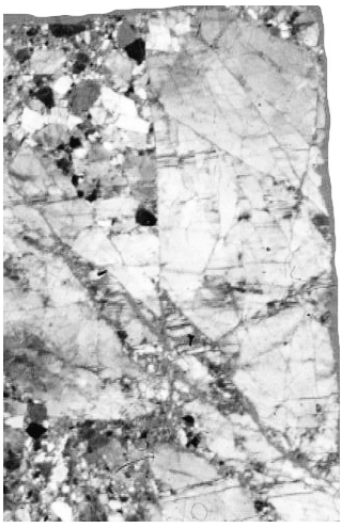
9 (4 pts) Explain why Mercury is not geologically active today.

"Australian rocks dated at 3.5 billion years contain fossilized traces suggesting that microbes were already well ensconced by then. But the ancient Earth was no Garden of Eden. Huge asteroids and comets mercilessly pounded the planet, creating conditions more reminiscent of hell."

10 (6 pts) The quote above is from the April 10, 2005, *New York Times*. Explain how we know the ancient Earth was bombarded by huge asteroids. Do not just say this was the time of heavy bombardment!

11 (4 pts) Why do we not have evidence of this event on the surface of the Earth?

12 (6 pts) Explain why the bombardment of these huge asteroids would have depleted the volatiles on the Earth's surface.



13 (3 pts) On the left is an image on a thin section of a lunar sample. Based on the lunar sample images you looked at in lab what type of rock is it? (check one)

◯ Basalt
◯ Regolith
◯ Pristine Highland Rock

14 (6 pts) Describe how the parent rock formed. (The parent rock is the rock from which this thin–section was taken.)

15 (8 pts) Explain whether this rock would be rare or common on the surface of the present day Earth and why.

16 (8 pts) In the space below, sketch and label the crater density plot of the Earth. Make sure to provide a range and label for the axes.

17 (8 pts) On the same plot above, sketch and label the crater density for a **similarly aged** surface on the Moon, and explain why it is different.