ASTRONOMY 150 – MIDTERM Name: _____

October 28, 2004 – Autumn 2004 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) Iron has a density of about _____ g/cm^3, water has a density of _____ g/cm^3, and rocks have a density of about _____ g/cm^3.

1 (4 pts) Describe one piece of evidence that at least one place on Mars had water on its surface.

2 (8 pts) Unlike the Earth, Mars does not have a large moon. Explain why this may be a factor in creating the dry desert climate of Mars.

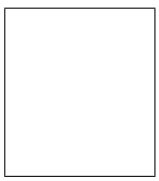
You have discovered a new planet orbiting the Sun at a distance of 1.5 AU. This planet is half (1/2) the size of the Earth, and a quarter (1/4) as massive. The planet has an uncompressed density of 3.8 g/cm^3 and a moment-of-inertia factor of 0.39.

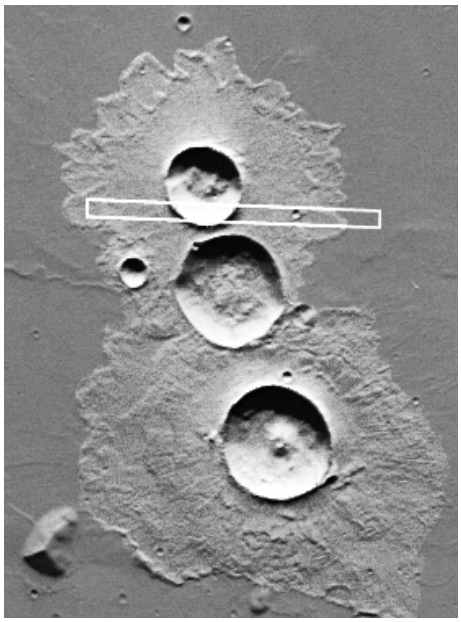
3 (5 pts) How does the gravity of this planet compare to the Earth's gravity? [Be quantitative; show your work.]

4 (4 pts) What is the most likely composition of this planet? Qualitatively indicate the amount of each substance (*e.g.* About 50% cheese and 50% iron.)

5 (3 pts) Describe how the mass is distributed in the interior.

6 (6 pts) Would you expect the geological activity on this world to be greater or less than the Earth's? Explain your answer.





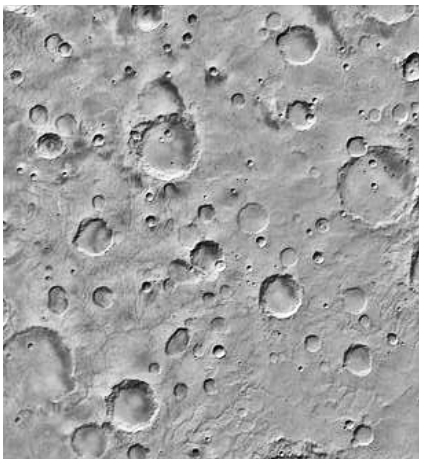
To the left is an image of a series of impact craters on **Mars**.

7 (6 pts) Describe how these features were formed and why they are circular.

8 (4 pts) What are the characteristics of these craters that let you know they were formed on Mars and not on the Moon?

9 (4 pts) The larger crater at the bottom of the image is about 20 km in diameter. At what depth do the deepest rocks evacuated originate?

10 (4 pts) Where around the crater are these deepest rocks found?



To the left is an image of a piece of the surface of **Mars**.

11 (4 pts) How does the age of this surface compare to the age of the lunar mare?

12 (4 pts) How did you estimate the age of this surface?

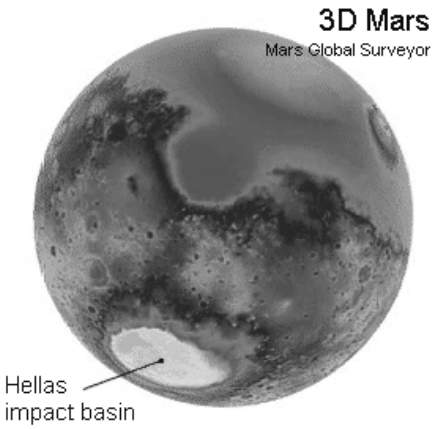
13 (4 pts) Explain why this estimate may be very wrong.

14 (4 pts) How would you determine the **exact** age of this surface?

15 (6 pts) Describe how the surface pictured on the previous page would look different if Mars had a thick atmosphere.

16 (6 pts) Explain why we believe the atmosphere of Venus was initially rich in water.

17 (4 pts) Ultraviolet light destroyed the water in Venus' atmosphere by breaking up the water molecules into their component hydrogen and oxygen atoms. What happened to all of the hydrogen?



18 (10 pts) The **Hellas Basin** is a very large (> 2000 km) impact basin on the surface on Mars. Without knowing anything else about it, correctly estimate the age of the basin (be quantitative) and explain how you determined the age.

19 (5 pts) Earth has no large impact basins on its surface. Explain why this is.