ASTRONOMY 150 – MIDTERM   Name: ⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯

February 3, 2005 – Winter 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) 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 (6 pts) We have seen basalt or basalt-like rocks on every world so far. Describe what basalt looks like and how it is formed.

2 (4 pts) Explain why it is very unlikely to find a 500 million-year-old piece of basalt on the Moon.

3 (4 pts) Explain why it is much more likely to find a 500 million-year-old piece of basalt on the surface of Venus.
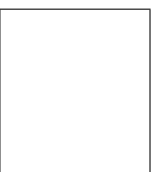
The table below shows the properties of three planets orbiting a star that is identical to our Sun. Use these data to answer the questions on this page.

Planet	Mass [Earth = 1]	Radius [Earth = 1]	Uncompressed Density [g/cm^3]	Moment-of-Inertia Factor [K]
ATHOS	1/8	1/2	4.0	0.40
PORTHOS	1	1	4.0	0.30
ARAMIS	1/3	2/3	4.0	0.35

For each of the three worlds, explain what the composition of the world is (2 pts), how the mass is distributed in the interior (2 pts) and how the gravity compares to Earth's gravity [show your work] (2 pts).

4 (6 pts) ATHOS

Composition:

Interior Mass Distribution:

Gravity:

5 (6 pts) PORTHOS

Composition:

Interior Mass Distribution:

Gravity:

6 (6 pts) ARAMIS

Composition:

Interior Mass Distribution:

Gravity:

Carbon dioxide (CO_2) is a very common gas released from the melting of rocks. It is a major component of secondary atmospheres in the inner solar system.

7 (5 pts) Explain why the Earth does not have a CO_2 rich atmosphere.

8 (5 pts) Explain why the Moon does not have a CO_2 rich atmosphere.

9 (5 pts) What is the property of CO_2 that makes it a good "greenhouse gas"? [Because it causes the greenhouse effect is not a good answer.]
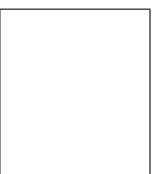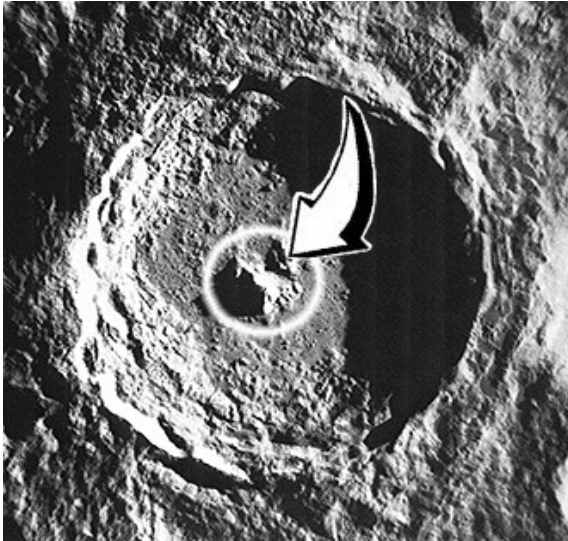
On the left is an image of a complex crater on the Moon.

10 (6 pts) Identify the feature marked in the center of the crater, and describe how it was formed.

11 (3 pts) What is the most likely value for the diameter of this crater [make sure you pay attention to the units!]

  (a) 10 - 100 mm
  (b) 10 - 100 cm
  (c) 10 - 100 m
  (d) 10 - 100 km

12 (8 pts) Explain why complex craters are relatively more common than simple craters on Venus.
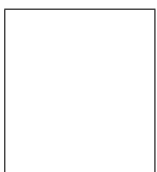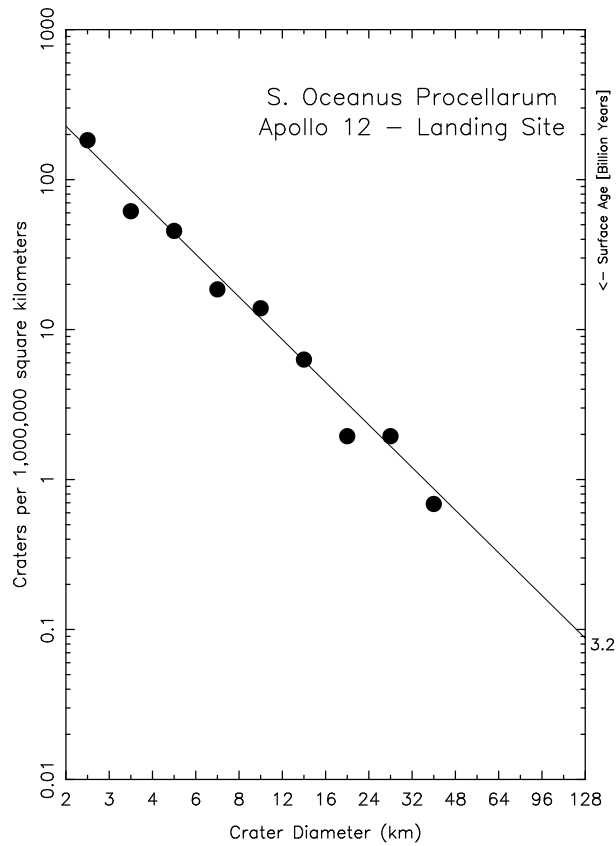
13 (2 pts) What is the atmospheric pressure in this room?

14 (6 pts) At the temperature and pressure in this room, which is more **volatile** rock or water? Explain your answer.

15 (8 pts) Explain why the **Giant-Impact** theory of Earth-Moon formation does a good job of explaining the lack of volatiles in the Earth-Moon system.

**S. Oceanus Procellarum
Apollo 12 — Landing Site**

Craters per 1,000,000 square kilometers

Crater Diameter (km)

<− Surface Age [Billion Years]

3.2

The plot on the left is a plot of the crater density at the landing site of Apollo 12. The plot shows the crater density of a 3.2 billion year old surface.

16 (3 pts) How many 10 km craters are there in a million square kilometer piece of this surface?

17 (6 pts) How do we know the age of this surface?

18 (6 pts) On the same plot, above sketch the crater density distribution of a 3.2 billion-year-old surface on the **Earth**.