ASTRONOMY 150 – MIDTERM Name: _____

February 6, 2003 – Winter 2003 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) Rocks have a density of about _____ g/cm^3, water has a density of _____ g/cm^3, and iron has a density of about _____ g/cm^3.

The table below shows the properties of four planets orbiting a star that is identical to our Sun. Use these data to answer the questions on the next **three** pages.

Planet	Mass [Earth = 1]	Radius [Earth = 1]	Uncompressed Density [g/cm^3]	Moment of Inertia Factor [K]	Average Distance from star [AU]
GOLIATH	1/7	1/2	5.7	0.35	0.4
FASOLT	1/4	2/3	4.3	0.38	0.8
ANDRE	1	1	4.0	0.32	1.0
POLYPHEMUS	1/6	2/3	3.2	0.40	1.2

1 (4 pts) If we assume that these planets are made of the same materials as our solar system (ice, rock, and iron) what is the most likely composition of the planet POLYPHEMUS?

2 (6 pts) Make an educated guess as to the value of the compressed density of the planet GOLIATH.

Compressed density: _____ g/cm^3

Explain your answer.

Below are three statements about the worlds listed on the previous page. For each statement, indicate whether it is true or false (2pts) and explain your reasoning (5pts).

3 (7 pts) The interior of planet ANDRE has never been heated above the melting point of rock.

◯ True ◯ False

4 (7 pts) It takes 400 Earth-days for planet FASOLT to go around the central star.

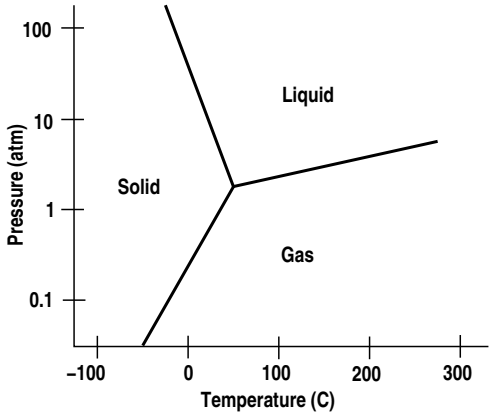
◯ True ◯ False

5 (7 pts) Planet GOLIATH is three times closer to the central star than planet POLYPHEMUS, so the gravity on GOLIATH's surface would be 9 times greater.

◯ True ◯ False

The table on the left shows the properties of the atmospheres of the four planets. The graph on the right shows the phase diagram for a substance *Soylent Green* that is common on all of the worlds. Use these data to answer the questions on this page.

Planet	Surface Temp [°C]	Surface Pressure [atm]	Composition
Goliath	300	...	No Atmosphere
Fasolt	200	1.0	96% CO_2
Andre	200	10.0	95% CO_2
Polyphemus	-50	0.1	94% CO_2



6 (2 pts) What is the phase of *Soylent Green* on the surface of Fasolt? ◯ Solid ◯ Liquid ◯ Gas

7 (2 pts) What is the phase of *Soylent Green* on the surface of Andre? ◯ Solid ◯ Liquid ◯ Gas

8 (2 pts) What is the phase of *Soylent Green* on the surface of Polyphemus? ◯ Solid ◯ Liquid ◯ Gas

9 (5 pts) Describe how the phase of *Soylent Green* would change as you go below the surface of Fasolt.

10 (5 pts) Explain whether these are primary or secondary atmospheres.

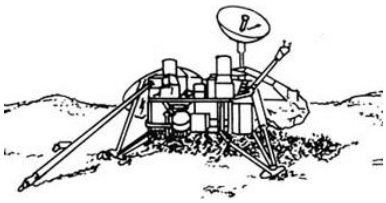
Time	Event	Activity
4.6 Byrs	Origin	Giant Impact
4.4 - 4.0	Differentiation	Core Formation
3.8	Late Heavy Bombardment	Impact Basins Form
3.8 - 2.0	Geological Activity	Mare Form
2.0 - Now	Big Chill	Low-level cratering

On the left is a table that shows the timeline of the surface history of the **Moon**. Use this information to answer the questions on this page.

11 (8 pts) Explain how and why the table above would differ for the planet Mars.

12 (4 pts) The "Genesis" rock picked up by Apollo 15 is an example of the original Lunar crust. When did this rock form?

13 (4 pts) Explain why "Genesis"-type rocks would be **very** rare on the surface of Venus.

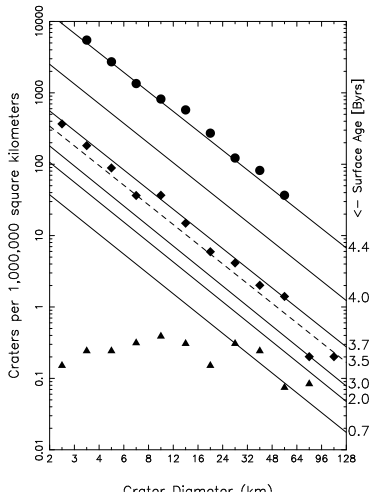


The first robot landers on the Moon, Mars, and Venus landed in very similar regions: The mare on the Moon, the northern hemisphere of Mars and the lowlands of Venus.

14 (8 pts) Describe how these regions are similar. Be sure to cover how they were formed, what they look like, and the types of rocks you would find.

15 (8 pts) Explain why these types of regions are attractive landing spots.

On the right is a plot showing the crater density of the lunar highlands (○), the lunar mare (◇), and the Earth (△). Use these data to answer the questions on this page.



16 (4 pts) How old is the lunar mare?

17 (6 pts) The Moon is a **much** smaller target than the Earth, but has many more large impact craters on its surface. Explain why the Moon has a greater number of large impact craters.

18 (6 pts) The lunar mare and highlands have about 1000 times as many 1 km craters as 100 km craters. The Earth has about the same number of 1 km craters as 100 km craters. Explain why the Earth has so few small craters.