

February 7, 2002

TA's Name & Section (2 pts): _____

**Answer all questions in the space provided. If you have any questions, raise your hand.
100 points possible.**

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

The chart 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 two pages.

Planet	Mass [Earth = 1]	Diameter [Earth = 1]	Uncompressed Density [g/cm^3]	Moment of Inertia Factor [K]	Average Distance from Star [AU]
LEONORE	1/8	1/2	5.0	0.38	0.4
VIOLETTA	1/10	1/2	4.0	0.40	0.8
TATYANA	6	2	3.8	0.30	1.0
ISOLDE	1/2	1	2.5	0.36	2.0

1 (6 pts) How long does it take the planet ISOLDE to orbit the star? [Show your work]

- ☐ Less than 1 year
- ☐ Between 1 and 2 years
- ☐ Between 2 and 3 years
- ☐ Between 4 and 5 years
- ☐ Greater than 5 years

2 (5 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 TATYANA?

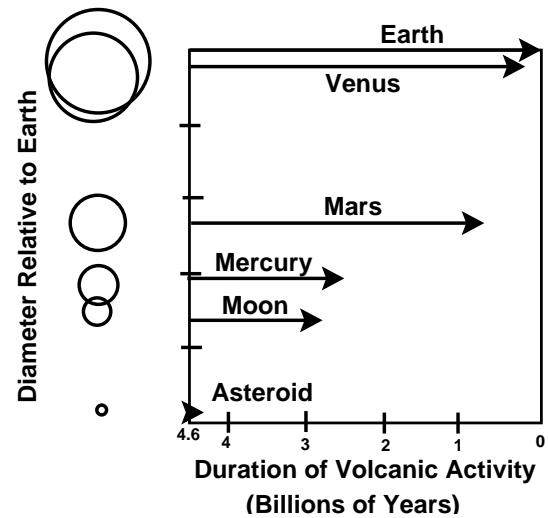
3 (8 pts) How does the gravity on LEONORE compare to the gravity on the ISOLDE? [Show your work.]

4 (5 pts) Which of the planets is the **most** differentiated? [Explain your answer.]

5 (6 pts) Explain why we can not use crater counting to determine the absolute age of the surface of VIOLETTA.

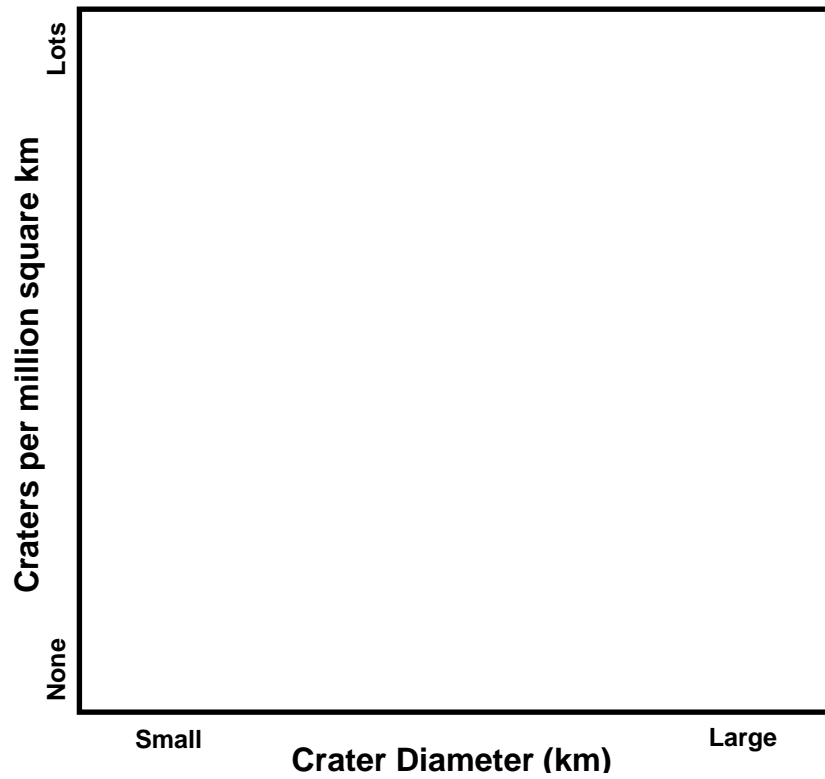
We have seen this plot a lot in class. It shows that larger worlds are geologically active for longer periods of time than smaller worlds.

6 (8 pts) Explain why larger worlds are geologically active for longer periods of time than smaller worlds.



7 (3 pts) A few of the meteorites collected on the Earth are 1-billion-year-old pieces of basalt. According to the graph above, which worlds are possible sources for these meteorites?

8 (5 pts) Which of these worlds is the most likely source and why?



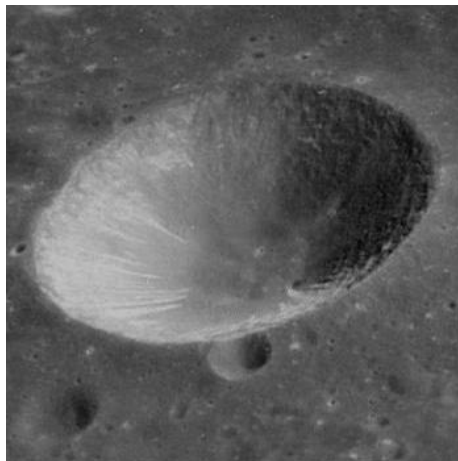
On the graph above, **sketch and label** the crater size distributions of the following three worlds:

9 (4 pts) **(A)** - An airless world with a very old surface.

10 (4 pts) **(B)** - A world with a very old surface and a thick atmosphere.

11 (4 pts) **(C)** - A geologically active world with no atmosphere.

12 (4 pts) How would you determine the **actual** age of the surface of world **(B)**?



13 (3 pts) What is the name of the geological feature shown in this image of the surface of the Earth's moon?

14 (9 pts) Describe how this feature was formed and where the energy for its formation came from. Also explain why is it circular.

15 (5 pts) Explain why these features were visited by the Apollo astronauts on every mission. [Hint: it is not only because they are common on the Moon.]

16 (4 pts) Describe one property of the Earth–Moon system that the *Fission* theory of lunar origin does a **good** job of explaining.

17 (6 pts) Venus, Earth, and Mars all began with lots of carbon dioxide (CO₂) in their atmospheres. The Earth currently has very little CO₂ in its atmosphere. Explain what happened to it.

18 (6 pts) Basalt is a very common rock in the inner solar system. For each of the following worlds, name a *specific* place where you would find basalt.

The Earth

Mars

The Moon