

December 12, 2000

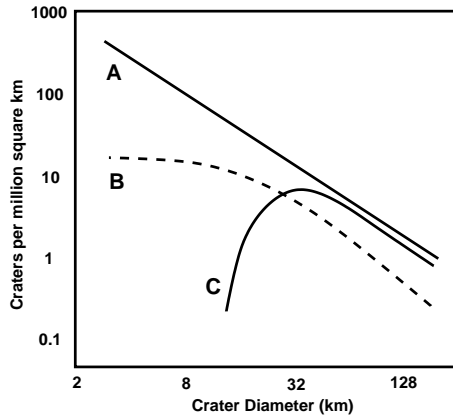
TA's Name & Section: \_\_\_\_\_

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

**1** (5 pts) I said that the age of the surface of Jupiter's moon Callisto is about 4 billion years old. Explain how this age is determined?

**2** (8 pts) Everything in our Solar system was formed from the same "solar abundance" material. However, when we pick-up a typical rock on the surface of the Earth its composition is very different from "solar abundance". Explain why this is.

**3** (4 pts) Where in the Solar system could you pick-up a rock of "solar abundance" material?



On the left is a plot of the global crater density on three different worlds. These three worlds include:

- One world with a thick atmosphere
- One “dead” airless world
- One “recently active” airless world

Use this information to answer the questions on this page.

4 (4 pts) Which world has a thick atmosphere? (check one)

☐ A

☐ B

☐ C

Explain your reasoning:

5 (4 pts) Which world is the “dead” airless world? (check one)

☐ A

☐ B

☐ C

Explain your reasoning:

6 (4 pts) Which world is the “recently active” world? (check one)

☐ A

☐ B

☐ C

Explain your reasoning:

7 (4 pts) Which world has the youngest surface (check one)

☐ A

☐ B

☐ C

Explain your reasoning:

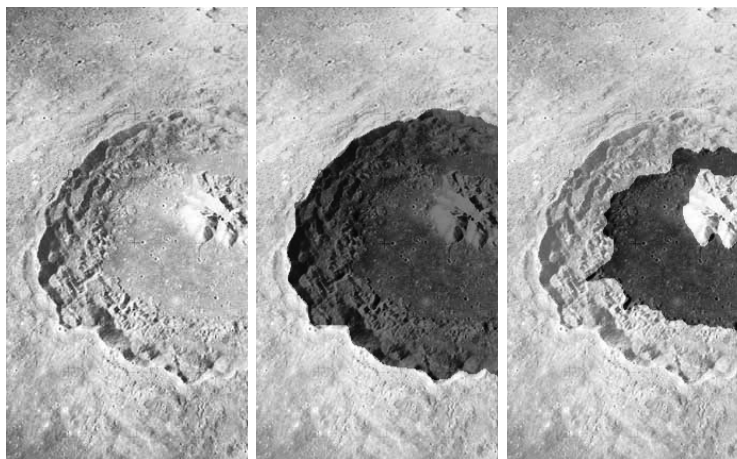
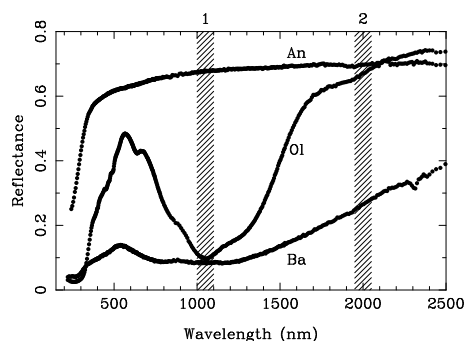
Whether they ever find life there or not, I think Jupiter should be considered an enemy planet.

– *Deep Thoughts by Jack Handey [SNL]*

**8** (6 pts) While Jupiter itself may not have life, its moon Europa may be our best bet for finding Earth-like life on another world. What makes Europa an attractive candidate for Earth-like life?

**9** (5 pts) Jupiter may not be an enemy planet, but it does have a large influence in our Solar system. Describe one way Jupiter has affected the Earth.

**10** (6 pts) I said that the giant planets Jupiter and Saturn are more like stars than the terrestrial worlds we have studied. Why is this?



VISIBLE

FILTER 1

FILTER 2

On the left is a plot of the reflectance spectra of three different rock types (AN, OL AND BA) and the bandpasses of two different filters (FILTER 1 and FILTER 2). On the right are three images of a site on the Moon. The first image is taken in visible light (all wavelengths), the second through FILTER 1, and the third through FILTER 2. The table on the right lists the densities of the rocks. *Use all of this information to answer the questions on the next two pages*

Rock Type	Density [g/cm <sup>3</sup> ]
AN	2.7
OL	3.3
BA	3.0

**11** (5 pts) What type of geological feature is shown in the image and how was it formed?

**12** (5 pts) What rock type would you expect to find deepest in the Moon? Explain.

**13** (5 pts) Describe the distribution of the rock type AN in the region imaged.

**14** (5 pts) Describe the distribution of the rock type OL in the region imaged.

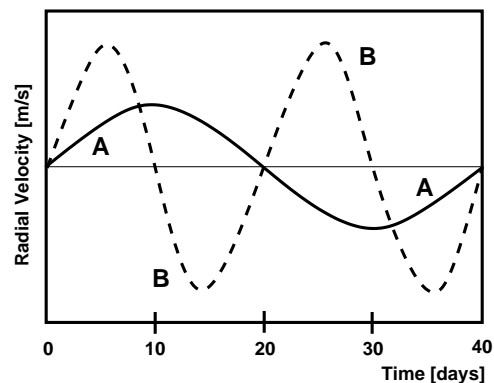
**15** (5 pts) Describe the distribution of the rock type BA in the region imaged.

**16** (8 pts) Describe a plausible geological history for this site. List the series of events that led to the formation of this geological feature and to the observed distribution of rock types. (I have started the list for you.)

1. Start with a lunar surface composed of the rock type: \_\_\_\_\_

On the right is a plot of the Radial Velocity vs. Time for two different planets orbiting a star *exactly* like our Sun. Assume that the orbits of the planets are circular and that we are viewing the system nearly edge-on.

**NOTE:** Be *very* careful. The plot shows the motions of the *planets* around the star. **NOT** the motions of the central star itself.



17 (2 pts) What is the period of Planet A? \_\_\_\_\_ [days]

18 (2 pts) What is the period of Planet B? \_\_\_\_\_ [days]

19 (5 pts) Which planet orbits closest to the star? Explain how you determined this.

20 (8 pts) Assume that Planet B has a mass of 5 Jupiter masses and that Planet A is much less massive than Planet B. Use these facts, plus your answers to the previous three questions, to explain why this planetary system will probably not last a very long time.