ASTRONOMY 150 – FINAL Name: _____

March 17, 2004 – Winter 2004 TA's Name & Section: _____

Answer all questions in the space provided. If you have any questions, raise your hand. 100 points possible. No calculators.

1 (6 pts) Explain why it is difficult to detect extra-solar planets (even large ones) far from their central star.

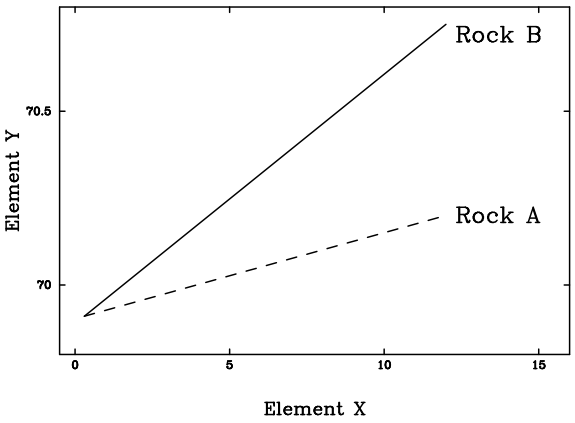
2 (6 pts) Explain why we believe short-period comets need to be replenished.

3 (4 pts) What does it mean for an asteroid to be in a 3:1 resonance with Jupiter?

4 (8 pts) Explain how we know some asteroids have **always** been small and undifferentiated.

5 (8 pts) Explain how we know some asteroids are large and differentiated.

6 (2 pts) What types of rocks would you find on the surface of a geologically active asteroid?



Assume that the radioactive element **X** decays into the stable element **Y** (X → Y). On the left is a plot of the **X** and **Y** abundance for two basaltic rock samples **A** and **B**. We use this plot to determine the age of rock samples. One of the rocks is from the surface of an asteroid and one is from a mare surface of the Moon. Use this plot to answer the questions on this page.

7 (8 pts) Which of the samples is from the surface of an asteroid? ◯ Rock A ◯ Rock B

Explain your answer:

8 (8 pts) Which of the samples is from a mare surface of the Earth's Moon? ◯ Rock A ◯ Rock B

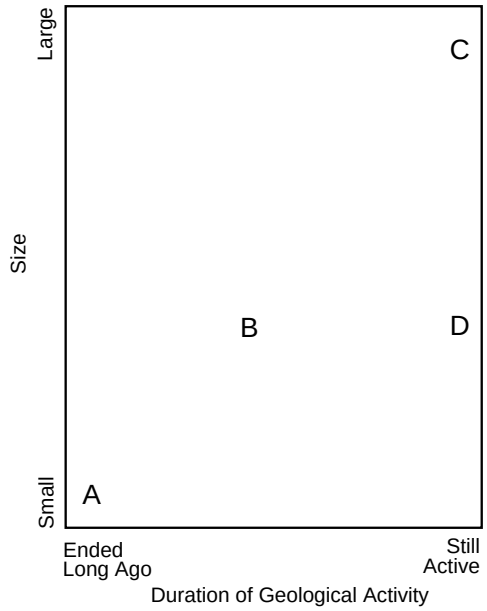
Explain your answer:

9 (4 pts) Explain what it means for a substance to be more volatile than another substance.

10 (8 pts) Explain why the amount of volatile material **increases** as you increase your distance from the Sun.

11 (4 pts) The Roche limit for Saturn lies about 2.5 planetary radii away. At this distance we find:

(a) the orbit of Titan
(b) the largest gap in Saturn's rings
(c) the outer edge of the rings
(d) the inner edge of the rings
(e) the orbit of the outermost satellite



On the left is a plot of the Duration of Geological Activity vs. Size for 4 worlds (A,B,C and D). Use this plot to answer the questions on this page.

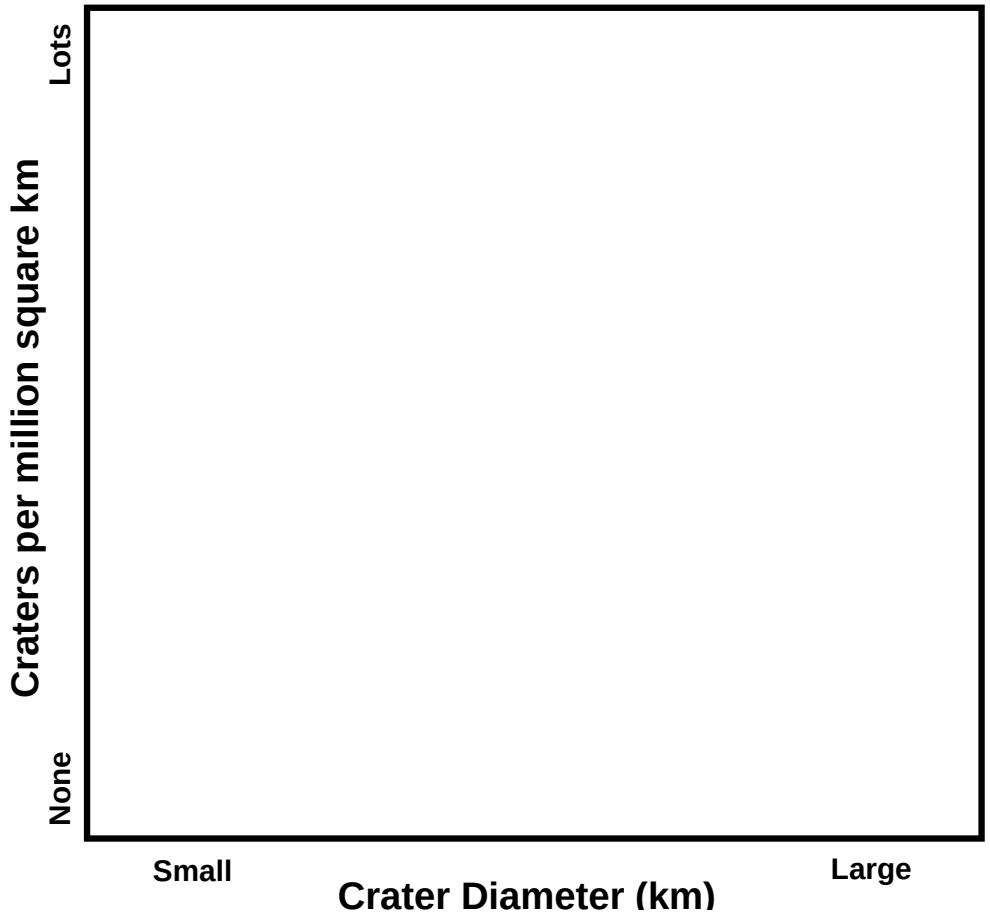
12 (4 pts) Which of these worlds is being heated by the radioactive decay of elements in its interior? (There may be more than one world)

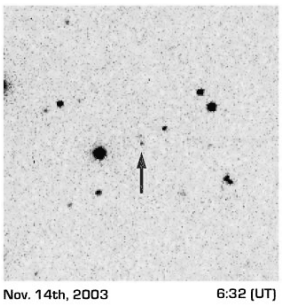
◯ A ◯ B ◯ C ◯ D

13 (4 pts) Which of these worlds is being tidally heated? (There may be more than one world)

◯ A ◯ B ◯ C ◯ D

14 (8 pts) On the graph below, **sketch and label** the likely crater density distribution of the four worlds.





15 (8 pts) The newly discovered Kuiper Belt Object named *Sedna* is described as dark and very red. In the space below, sketch the reflectance spectrum of *Sedna*. Make sure to label the axes.

16 (8 pts) Saturn's moon Titan has the same escape velocity as the Earth's Moon. Describe what would happen to Titan's **atmosphere** (4 pts) and **surface** (4 pts) if you moved Titan inward to 1 AU from the Sun.

17 (2 pts) And finally, list the top 100 objects in the solar system.