Astronomy 150 - Exam #3 Name: _____

December 13, 1996 TA's Name & Section: _____

Answer all questions in the space provided. Please write in complete sentences. If you have any questions raise your hand. 120 points possible.

1 (8 pts) We have learned that worlds in our solar system are basically composed of a mixture of Hydrogen, Helium, Ice (Water), Rocks, and Metals. For each of the solar system worlds listed below indicate what they are composed of. List the materials from most abundant to least abundant.

(Example) Earth: Rocks, Metal.

Mercury:

Mars:

Jupiter:

Callisto:

Saturn Ring Particles:

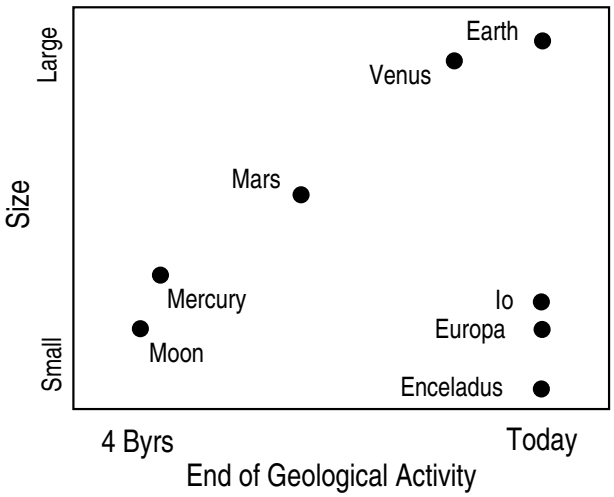
Enceladus:

Uranus:

Cometary Nucleus:

2 (2 pts) A volcano on Io can throw material about 1000 times higher than a similar volcano on the Earth. Why is there such a difference? (2 reasons)

3 (4 pts) The space shuttle orbits well within the Earth's Roche limit and yet it is not pulled apart by tidal forces. Explain why this is so.



4 (4 pts) This is a diagram of the geological activity of some solar system objects vs. their size. What is unusual about the position of Io, Europa, and Enceladus in this diagram?

5 (2 pts) What one energy source drives (drove) most of the geological activity on the Earth, Venus, Mars, Mercury and the Moon?

6 (10 pts) Io, Europa, and Enceladus are geologically active today due to tidal heating. Describe how tidal heating works.

7 (8 pts) Describe two similarities and two differences between the interiors of Jupiter/Saturn and Uranus/Neptune. Do NOT use size or mass of the planets as one of your arguments. (Consider Jupiter/Saturn as one type of planet and Uranus/Neptune as another.)

8 (4 pts) Describe one similarity and one difference between the Kirkwood gaps in the asteroid belt and the gaps in the ring of Saturn.

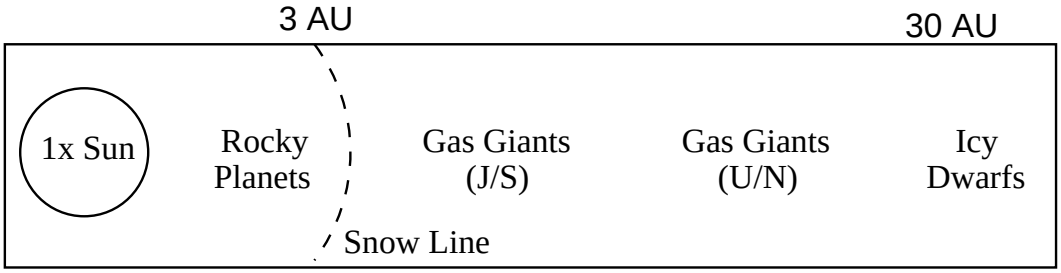
9 (8 pts) Assume that Earth has the same axial tilt as Uranus (only axial tilt not distance or orbital period). Describe a year of seasons in Seattle (latitude 47°). Be sure to describe the path of the sun in the sky during each season. Start with winter.

10 (5 pts) Describe how the Greenhouse effect works. (Use the Earth's atmosphere as an example)

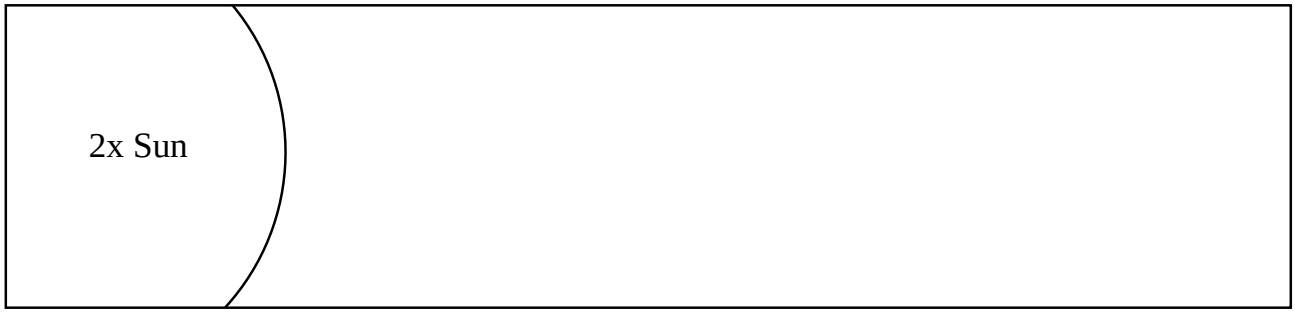
11 (5 pts) **Describe** what would happen to the Earth's atmosphere if you moved Earth to the same orbit as Venus.

12 (8 pts) I said that Pluto is not really a planet in the classical sense, but that it and Neptune's moon Triton are the largest objects in the Kuiper Belt. Explain why Pluto and Triton should be considered Kuiper Belt objects.

This is a diagram of the basic structure of our solar system.



13 (5 pts) Assume that our solar system formed around a star twice as luminous (hot) as our Sun. Indicate on the figure below (using the same labels as the first figure) what you think the basic structure of our solar system would look like then.



14 (8 pts) Explain your reasoning for your answer to question #13.

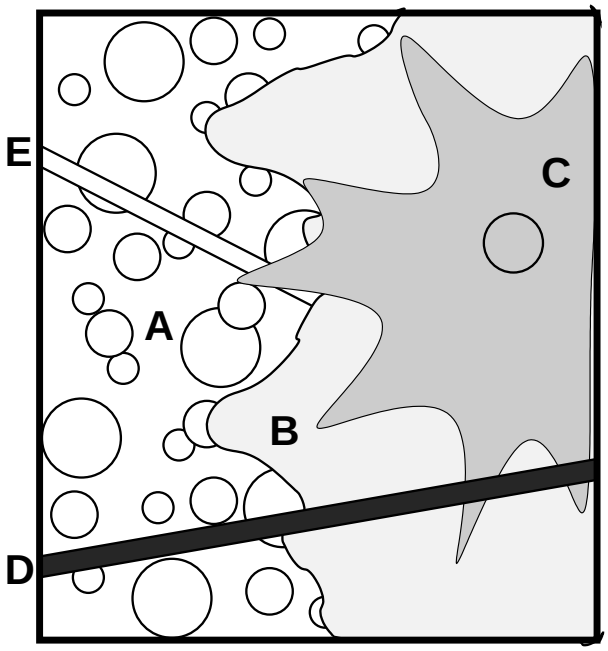
15 (4 pts) Astronomers have recently discovered a Jupiter-sized gaseous planet orbiting at a distance of 0.05 A.U.s from the solar-type star 51 Pegasi. Give two reasons why this was unexpected based on what we know of our solar system.

16 (5 pts) The atmospheres of Jupiter and Saturn are similar in composition and structure yet from the outside look very different from each other. Explain why they look different.

17 (8 pts) Explain how Jupiter and Saturn formed and why they were able to grow so large.

18 (5 pts) I have said that a "Giant Impact" is almost always a good answer to explain unusual phenomena in our solar system (i.e. The Earth-Moon system). Describe one other unusual phenomenon (explain why it is unusual) and how a "Giant Impact" can explain it.

19 (5 pts) Below is a geological map of a planetary surface. Indicate the **relative** ages of the various landforms from oldest - formed first (1) to youngest - formed last (5).



A - Cratered Terrain _____

B - Basalt Flow _____

C - Crater and Ejecta _____

D - Straight Rille #1 _____

E - Straight Rille #2 _____

20 (2 pts) List the top 100 objects in the solar system

21 (10 pts) I am sure that there is a question that you really studied for but does not appear on this exam. Write out this question and answer it.

Make sure that your question is relevant to Astronomy 150, the level is appropriate (your question should be worth 10 pts), it is not a restatement of a question already asked, and that you answer it correctly!