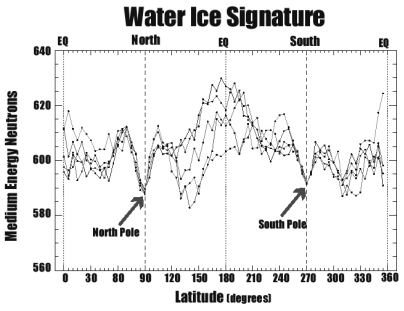
ASTRONOMY 150 - EXAM #3 Name: _____

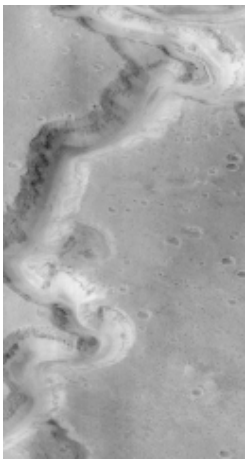
March 16, 1998 TA's Name & Section: _____

**Answer all questions in the space provided. Please write in complete sentences. If you have any questions, raise your hand. 90 points possible.**

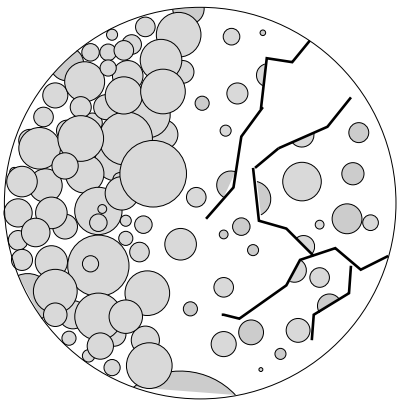



**1** (10 pts) Last week the *Lunar Prospector* spacecraft detected water-ice on the Moon. The ice is in the form of crystals mixed in with the lunar regolith hidden in the permanently shadowed craters on the lunar poles. Explain why the water-ice detected was not part of the original material that made up the Moon.

**2** (5 pts) If the water-ice on the Moon did not originate on the Moon, where did it come from?



**3** (10 pts) On the left is a recent image taken by the *Mars Surveyor* spacecraft of an ancient river channel on Mars. If liquid water existed on the surface of Mars in the past, what was different about the conditions on Mars then as compared to now?

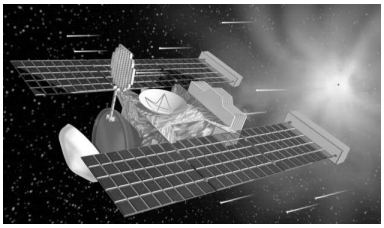


**4** (5 pts) On the left is a geological map of a satellite in the outer Solar system (the filled circles are impact craters and the lines are straight rilles). Is this satellite a (check one):

◯ Dead World
◯ Recently Active World
◯ Currently Active World

**5** (10 pts) In December of 1995, the *Galileo* spacecraft dropped a probe into the planet Jupiter. Assume the probe **could** survive all the way to the core. Describe the environment around the probe during its trip from the top of the clouds to the core of Jupiter. (Be sure to include such things as what types of materials/elements the probe would pass through, what phase they would be in, etc.)

**6** (4 pts) Jupiter's very large mass means that it has a large influence in our Solar system. List two ways that Jupiter has influenced other worlds or regions in our Solar system.



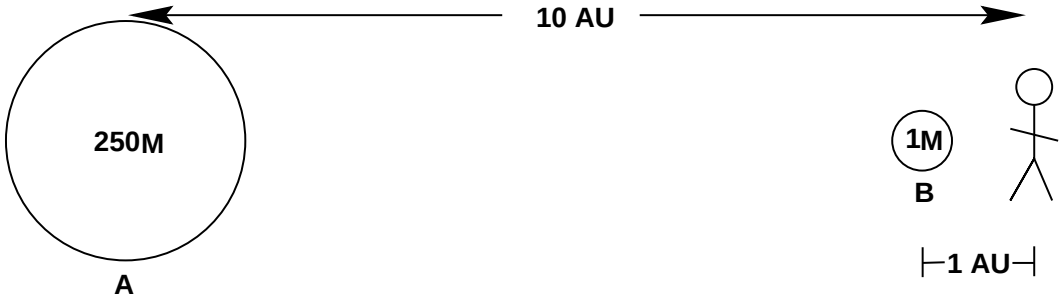
**7** (7 pts) Next year the *Stardust* spacecraft will be launched to rendezvous with a comet, collect samples, and return them to the Earth. Cometary material hits the Earth about as often as pieces of asteroids, yet we have to send spacecraft to retrieve cometary material. Why do we not have meteorites composed of cometary material?

**8** (8 pts) The Kuiper Belt was originally theorized as a reservoir of material for short-period comets. Explain why short-period comets need to be replenished.

**9** (10 pts) The nearby Solar-type star $\rho$ Coronae Borealis has a Jupiter-mass planet orbiting it at a distance of 0.23 AUs. **If** this planet is a Jupiter-sized gas giant, explain why it is unlikely that it formed at its present location. Assume this stellar-system is made of the same materials (in the same proportions) as our Solar system.

**10** (5 pts) If a planet did form at 0.23 AU from a solar-type star, describe its most likely composition and size.

In the middle of reading this question you are suddenly transported to a point in space 10 AUs from a 250 $M_\oplus$ planet (A) and 1 AU from a 1 $M_\oplus$ planet (B). Before you lose consciousness in the vacuum of empty space answer the next two questions.




**11** (6 pts) Which planet has a greater gravitational pull on you? [show your work] (remember: $F_{gravity} \propto M/d^2$)

**12** (6 pts) Which planet has a greater tidal force on you? [show your work] (remember: $F_{tidal} \propto M/d^3$)

Returning to the room, just before losing consciousness, you see the last question:

**12**$\frac{1}{2}$ (4pts) List the top 100 objects in the Solar System.