Astronomy 150 - Exam #1 Name: _____

October 24, 1997 TA's Name & Section (2 pts): _____

Answer all questions in the space provided. Please write in complete sentences. If you have any questions raise your hand. 100 points possible.

1 (5 pts) Apollo 15 landed next to Hadley Rille (a sinuous rille). Describe how this feature was formed and what types of rocks would you expect to find in Hadley Rille.

2 (5 pts) I said in class that the surface of Mercury and the Lunar highlands are about the same age because they have about the same crater density. Explain why this assumption may not be correct.

3 (3 pts) How would you find the **absolute** age of the surface of Mercury?

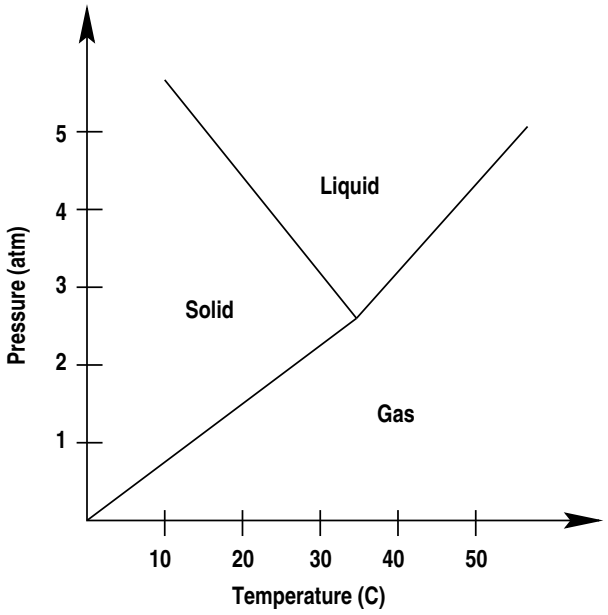
You have discovered an airless planet orbiting between the Earth and Mars. You measure its **compressed** density to be $\rho = 6\ gm/cm^3$ and its **uncompressed** density to be $\rho = 4\ gm/cm^3$.

4 (3 pts) Describe the approximate composition of this planet.

5 (4 pts) Is this world larger or smaller than Mars? Explain your answer.

6 (5 pts) If you were to half the size of the Earth (shrink its radius by a factor of two) **and** double the mass of the Earth, how much would it change the gravity on the Earth (how much would your weight change)? [show your work]

7 (10 pts) All of the worlds we have studied so far have impact craters. Pick one world (Mercury, Venus, or Mars) and describe two ways the impact craters on that world differ from impact craters on the Moon.



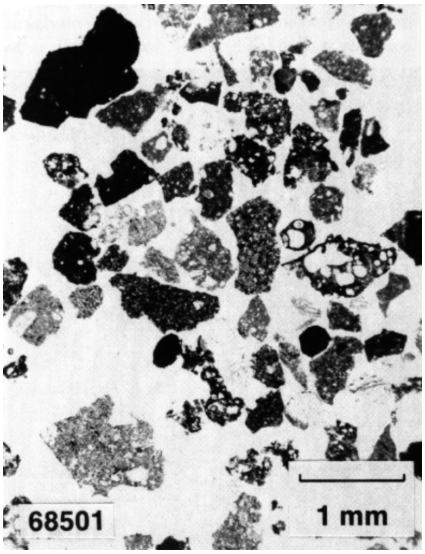
This is the phase diagram for a substance called Oobleck. Use it to answer the following three questions.

8 (2 pts) If the temperature in this room were 10 C what phase would Oobleck be in? (check one)

◯ Solid
◯ Liquid
◯ Gas

9 (5 pts) If I were to raise the temperature in this room slowly from 10 C to 55 C describe what would happen to the Oobleck.

10 (5 pts) If I were to increase the air pressure in this room to 4 times its normal value and then increase the room temperature slowly from 10 C to 55 C describe what would happen to the Oobleck.



This is an image of a thin–section of a Lunar sample we saw in class. Use it to answer the next four questions

11 (4 pts) What type of sample is this? (check one)

◯ Mare Basalt
◯ Impact Breccia
◯ Lunar Regolith
◯ Plutonic Rock
◯ Orange Soil

12 (4 pts) What are the characteristics of the thin–section that you used to answer the above question?

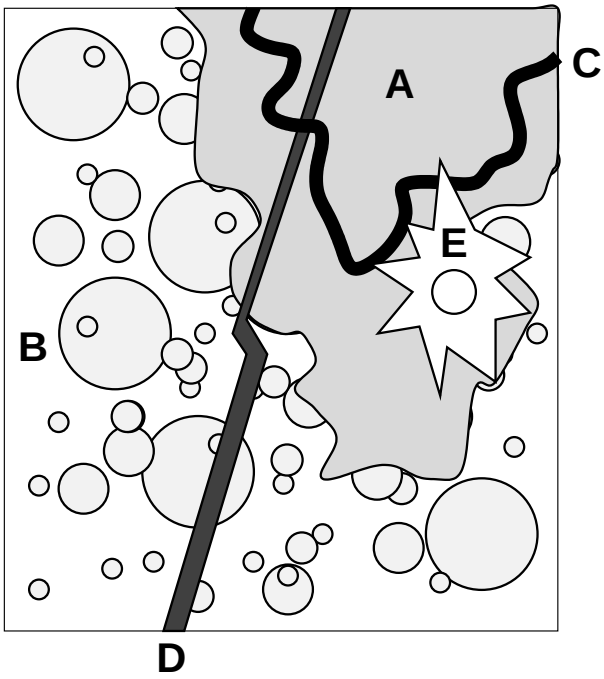
13 (5 pts) Describe how this sample was formed.

14 (5 pts) Where on the Moon would you expect to find this sample?

15 (3 pts) Explain what it means for a planetary body to be differentiated.

16 (10 pts) One to the constraints on the theory of the origin of the Moon is that it has to account for the fact that at one time a large portion of the outer layer of the Moon was molten. Explain why the existence of low density Plutonic rocks (plagioclase feldspar) makes us think the Moon once had a "Magma Ocean".

Below is a geological map of a planetary surface. Use it to answer the next three questions.



17 (5 pts) Indicate the **relative** ages of the various landforms from oldest - formed first (1) to youngest - formed last (5).

A - Lava Flow _____

B - Cratered Terrain _____

C - Sinuous Rille _____

D - Straight Rille _____

E - Crater and Ejecta _____

18 (5 pts) If you were to land on this surface at the point marked by the letter "B", what types of rocks would you find there?

19 (10 pts) You are in charge of planning a mission to this site. You have two constraints: 1) You can only explore a limited area (equivalent 1 in^2 on the map, the box on the left is 1 in^2) and 2) You can **not** cross either rille (C or D). Place an "**X**" on the map where you would land and explain why you chose this site.