ASTRONOMY 150 - EXAM #1 Name: _____

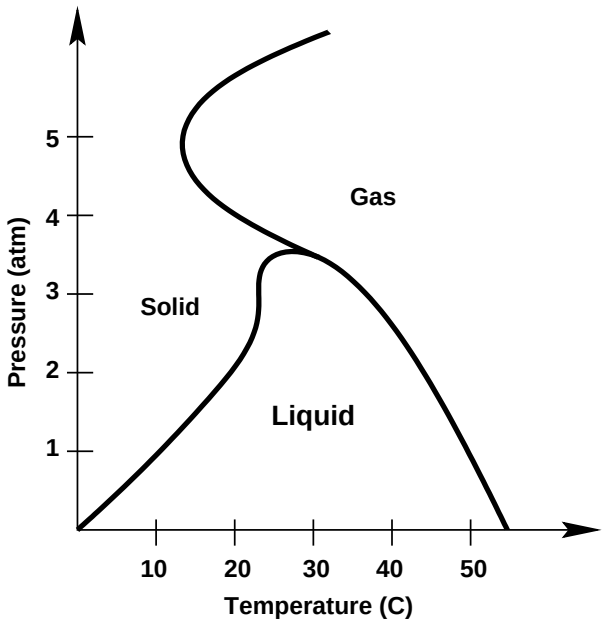
October 22, 1999 TA's Name & Section (2 pts): _____

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

1 (6 pts) You have discovered a planet, **Planet X**, that is one half the radius of the Earth and one half as massive. How does the gravity on the surface of **Planet X** compare to the Earth? [show your work]

2 (4 pts) You measure the **uncompressed** density of **Planet X** to be 5.0 g/cm^3. What is the most likely composition of the planet?

3 (6 pts) **Planet X** orbits a star **exactly** like our Sun. If **Planet X** is the same distance from its star as the Earth is from the Sun would you expect it to have an atmosphere? Explain why or why not.



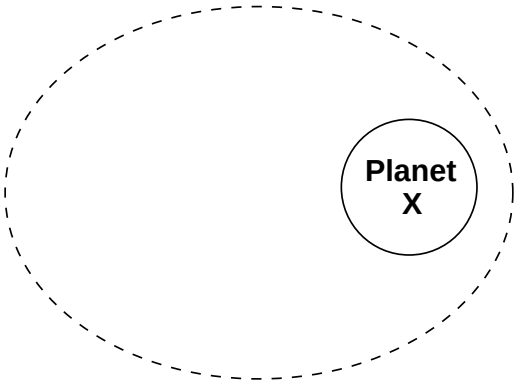
On your long trip to **Planet X** your food supply is a substance called *Soylent Green*. Use the phase diagram *Soylent Green* (shown of the left) to answer the next three questions.

4 (2 pts) If the temperature in this room were 20 °C what phase would *Soylent Green* be in? (check one)

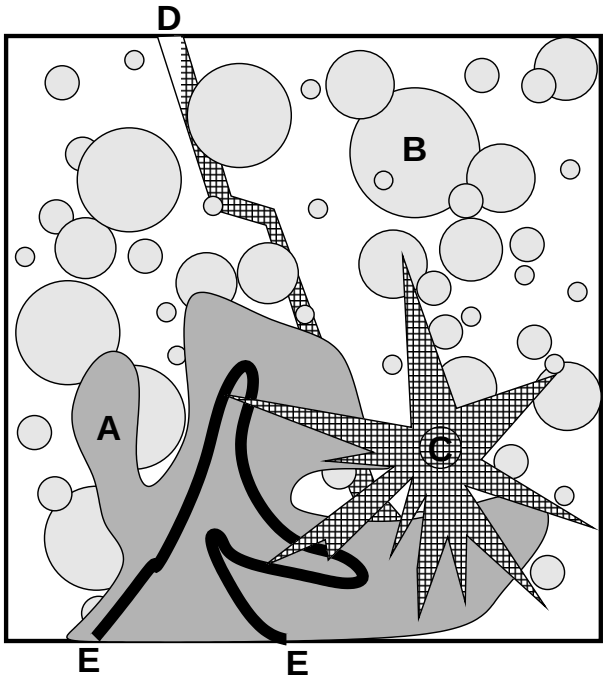
◯ Solid
◯ Liquid
◯ Gas

5 (4 pts) In this room *Soylent Green* would freeze at _____ °C and boil at _____ °C.

6 (8 pts) You place some *Soylent Green* in your hand (at room temperature) and slowly compress to 5 atmospheres. Describe the changes the *Soylent Green* goes through as you compress it. Be quantitative in your answer.



7 (2 pts) To the left is a diagram of the orbit of your spacecraft around **Planet X**. The best time to communicate with the Earth is when your spacecraft is moving the slowest. Mark on this diagram the place in the orbit where your spacecraft is moving the slowest.



8 (5 pts) From orbit around **Planet X** you create the geological map on the left. Indicate the **relative** ages of the various landforms from oldest (1, formed first) to youngest (5, formed last).

A - Lava Flow _____

B - Cratered Terrain _____

C - Crater and Ejecta _____

D - Straight Rille (Fault) _____

E - Sinuous Rille _____

9 (8 pts) You measure the crater density on the "Lava Flow" to be much less than that on the Lunar Mare. Based on the crater density alone, why may it be wrong to conclude that the age of the "Lava Flow" is less than that of the Lunar Mare?

10 (5 pts) How could you determine the actual age of the "Lava Flow"?

From orbit around **Planet X** you observe three planets with the **same mass and size as the Earth**. You measure the atmospheric pressure and the composition of a **few** gases in their atmospheres (see table below).

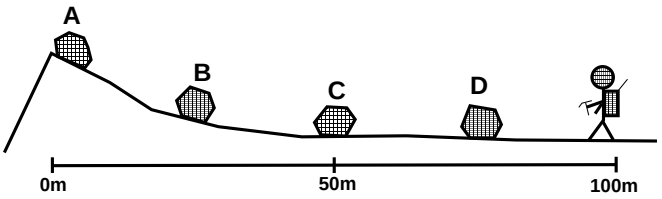
	Pressure	Atmospheric gases		
	[atm]	Hydrogen	Oxygen	Carbon Dioxide
Planet A	2	0%	10%	1%
Planet B	10	35%	0%	1%
Planet C	0.01	0%	0%	95%

11 (6 pts) Which planet is furthest from the center star? Explain how you determined that based only on the data above.

12 (6 pts) Which planet is closest to the center star? Explain how you determined that based only on the data above.

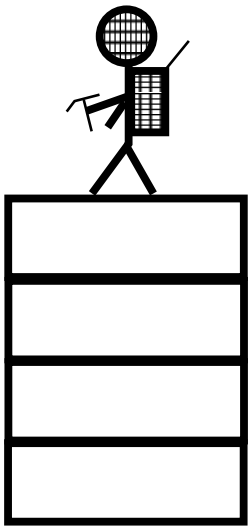
13 (6 pts) Which planet is most likely to have liquid water on its surface? Explain how you determined that based only on the data above.

After landing on the surface of **Planet X** the first thing you do is explore the area **outside** an impact crater and collect rocks as you approach the crater's rim. Back in the lab you determine what type of rocks you found by making thin-sections. The data is shown in the table on the below.



Rock	Distance from Rim (meters)	Rock Type
A	0	Pristine Highland
B	25	Basalt
C	50	Breccia
D	75	Regolith

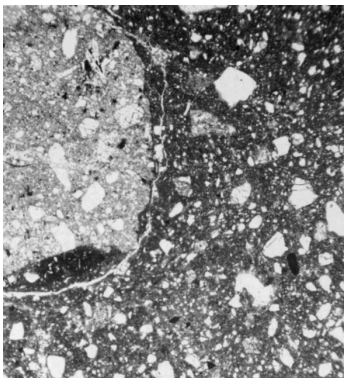
14 (7 pts) Which rock came from the deepest underground? ◯ A ◯ B ◯ C ◯ D
Justify your choice.



15 (4 pts) Based on the data above reconstruct the sequence of rocks on **Planet X** below your feet. Place the letter corresponding to the rock type in the boxes to the left. (e.g. Start by placing the letter corresponding to your answer above in the lowest box.)

16 (5 pts) If the impact crater is 500 meters in diameter how deep did the deepest rock originate? [show your work]

17 (10 pts) Write down a plausible geological history of the area where you landed based on your answers on the previous page. Describe the events that happened and the order in which they happened that explain how the rocks under your feet got there.



18 (4 pts) An image of one of the thin-sections you made is on the left. Based on the lunar samples you looked at in lab what type of rock is it? (check one)

◯ Basalt
◯ Impact Breccia
◯ Regolith
◯ Pristine Highland Rock