ASTRONOMY 150 - MIDTERM Name: _____

April 30, 2009 TA's Name & Section (2 pts): _____

Answer all questions in the space provided. If you have any questions, raise your hand. 100 points possible. NO CALCULATORS OR ANY ELECTRONIC DEVICES.

Four planets are orbiting a star that is identical to our Sun. We have observed these planets and collected the following data. **Use these data for the entire exam!**

Planet	Mass [Earth = 1]	Diameter [Earth = 1]	Density [g/cm^3]	Moment of Inertia factor [K]	Distance from star [AU]
ARDBEG	0.5	0.7	5.8	0.34	0.3
BOWMORE	0.8	0.9	4.4	0.36	0.7
CAOLILA	8.0	2.0	4.0	0.30	1.0
DALMORE	0.1	0.5	3.1	0.40	1.5

1 (3 pts) If we assume that these planets are made of the same materials as our solar system (ice, rock and iron) what is the most likely compositions of the planet **DALMORE**?

2 (6 pts) Which of the planets is **least** differentiated? Make sure to explain your answer.

3 (8 pts) How does the gravity on **CAOLILA** compare to the gravity on the Earth? Make sure to show your work.

4 (6 pts) Explain why the planet **CaolIla** would be the most likely of the four planets to still be geologically active today.

5 (2 pts) What type of rock would be most common on a geologically active surface of **CaolIla**?

6 (8 pts) You already determined how the gravity on **CaolIla** compares to the Earth. Based on this, would expect the mountains on **CaolIla** to be shorter or taller than the ones on Earth? [Explain your reasoning]

7 (8 pts) What is the type and age of the youngest rock you would expect to find on the surface of **D**ALMORE? Be as specific in the age and type as you can.

8 (8 pts) Explain why you would **not** use a radioactive element like Carbon-14 (half-life = 5,730 years) to determine the age of the surface of **D**ALMORE.

To explore the planets, you send an orbiter/lander sample-return mission to the planetary system. The orbiter collects the following data about the planetary atmospheres:

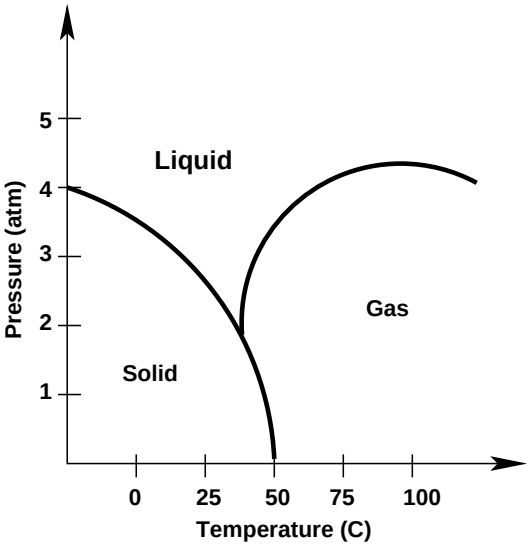
Planet	Surface Pressure [atm]	Surface Temperature Range [°C]	Composition
ARDBEG	...	$-100 \rightarrow 300$	No Atmosphere
BOWMORE	1.0	$0 \rightarrow 75$	96% CO_2
CAOLILA	5.0	$90 \rightarrow 95$	95% CO_2
DALMORE	...	$-300 \rightarrow -100$	No Atmosphere

9 (4 pts) Hydrogen is the most common gas in the universe, yet none of these planets has hydrogen in its atmosphere. Explain why this is.

10 (4 pts) Planets **B**OWMORE and **C**AOLILA have atmospheres that are rich in CO_2. Where did this CO_2 come from?

11 (8 pts) Explain why the **variation** in surface temperature is much larger on **B**OWMORE than on **C**AOLILA.

Your lander on **CaolIla** discovers the substance called *Oobleck* on the surface. The phase diagram for *Oobleck* is shown at the right.



12 (3 pts) What is the phase of *Oobleck* on the surface of **CaolIla**?

◯ Solid ◯ Liquid ◯ Gas

13 (3 pts) What is the phase of *Oobleck* high in the atmosphere of **CaolIla**?

◯ Solid ◯ Liquid ◯ Gas

14 (3 pts) What would the phase of *Oobleck* be in this room?

◯ Solid ◯ Liquid ◯ Gas

15 (8 pts) Based on the data given on the previous pages, explain why you would **not** expect to find life (like it occurs on Earth) on any of these worlds.

16 (8 pts) In the space below sketch and **label** the crater density diagram for **C**aolIla and **D**almore.

17 (8 pts) Explain why the impact of a 5 km asteroid would have a far larger global effect on **B**owmore than on **A**rdbeg.