

October 26, 2000

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 (3 pts) Water has a density of _____ g/cm^3 , rocks have a density of about _____ g/cm^3 and iron has a density of _____ g/cm^3 .

0 (4 pts) Write down the equation that describes the force of gravity between you and the Earth [be sure to say what your variables mean].

Four planets are orbiting a star that is identical to our Sun. From the Earth we observed these planets and collected the following data:

Planet	Mass	Diameter	Density [g/cm^3]		Average Distance from star [AU]
	[Earth = 1]	[Earth = 1]	Compressed	Uncompressed	
KENNY	0.20	0.50	8.0	8.0	0.5
KYLE	0.50	0.75	6.0	5.0	0.8
STAN	1.0	1.0	5.0	4.0	1.0
CARTMAN	4.0	2.0	2.5	1.0	3.0

1 (2 pts) Which of the planets takes the shortest time to orbit around the star?

2 (3 pts) How long does it take the planet STAN to orbit the star [show your work]?

3 (4 pts) If we assume that these planet are made of the same materials as our solar system (ice, rock and iron) what is the most likely compositions of the planet KENNY?

4 (4 pts) What is the most likely composition of the planet STAN?

5 (4 pts) Which of the planets is most likely the least geologically active? [Explain your answer].

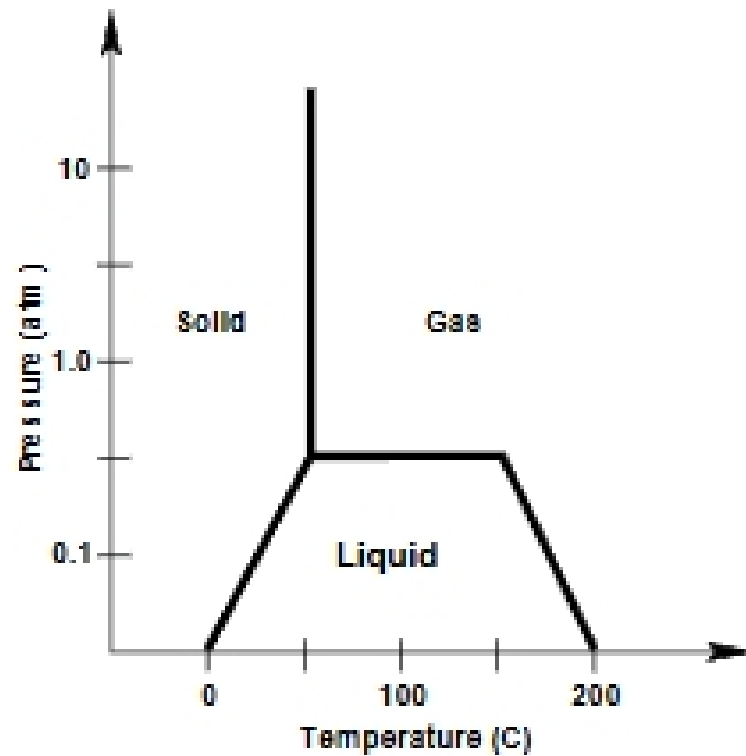
6 (5 pts) The planet CARTMAN is larger and more massive than the Earth. However, you would weigh the same on CARTMAN as you would on the Earth. Explain why this is [show your work].

You are part of the team of scientists that is sent to explore this planetary system. As you approach the system you measure the properties of the atmospheres the these planets.

Planet	Surface Pressure [atm]	Surface Temperature Range [°C]	Composition
KENNY	...	-100 – 300	No Atmosphere
KYLE	0.1	0 – 200	96% CO ₂ , 4% N ₂
STAN	1.0	10 – 50	95% CO ₂ , 5% N ₂
CARTMAN	10.0	90 – 110	98% CO ₂ , 2% N ₂

7 (6 pts) The planet CARTMAN is further away from the central star than STAN is, yet it has a higher surface temperature and a smaller range in temperatures. Explain how this can be.

8 (6 pts) Explain why it is unlikely than any of these planets have any Earth-like plant life on their surfaces even though some of the planets have warm, thick atmospheres.



Scientists on the Earth have proposed that a substance called *GUNK* may be found on the surfaces of some of the planets. On the left is a phase diagram for *GUNK*.

9 (4 pts) On the surface of *KYLE*, *GUNK* can exist in all three states. On *KYLE* the boiling point of *GUNK* is _____ [°C] and the freezing point is _____ [°C].

10 (4 pts) Before you arrived in the planetary system, it was theorized that large seas of *GUNK* may exist on the surface of the planet *STAN*. Based on the data you collected so far, explain if this is possible?

11 (5 pts) On the surface of *CARTMAN*, *GUNK* can only exist as a gas. However, clouds of liquid *GUNK* were detected in the atmosphere. Explain how this can be.