

**Answer all questions in the space provided. If you have any questions, raise your hand.  
100 points possible. No calculators.**

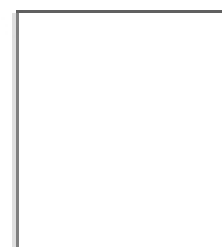
The star *51 Peg* has an extra-solar planet 0.47 times the mass of Jupiter (or a little more massive than Saturn) orbiting at a distance of only 0.052 AU. *Assume that the 51 Peg planet is made of the same type and abundance of elements as Jupiter.*

**1 (5 pts)** Explain why the 51 Peg planet would be difficult to detect if it was at the same distance as Jupiter.

**2 (8 pts)** Describe how the visible appearance of its clouds and the diameter of the 51 Peg planet would compare to Jupiter.

**3 (4 pts)** The Roche limit for Saturn lies about 2.5 planetary radii away. This distance is:

- (a) at the orbit of Titan
- (b) at the largest gap in Saturn's rings
- (c) near the outer edge of the rings
- (d) near the inner edge of the rings
- (e) just beyond the orbit of the outermost satellite



A friend hands you a piece of **basalt** he claims he saw fall from the sky. Since you have taken Astronomy 150, he knows you will be able to confirm that is it a meteorite.

4 (5 pts) If this sample is a meteorite, to what class of meteorites does it belong?

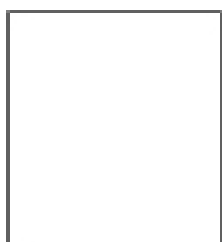
You take this sample to your lab and determine its age to be about 1 billion years old.

5 (5 pts) Explain why this sample probably did **not** originate in the asteroid belt or the Moon.

You measure that all of the **iron minerals** are strongly aligned (they all point in the same direction) in this sample.

6 (5 pts) Explain why this sample probably did **not** originate on Mars or Venus.

7 (5 pts) Explain the most likely origin of this sample.



A lot of the facts that we have learned in this class come from analyzing extraterrestrial materials. On the right is a table of 3 extraterrestrial samples we have discussed in class.

For each of the following facts, name the which sample was used to determine the fact (2 pts) and how the sample allowed us to determine the fact (5pts).

Sample	Collection Point
Moon Rock - Impact Breccia	Imbrium Basin, Apollo 15
Meteorite - Iron	Odessa, Texas
Meteorite - Carbonaceous Chondrite	Antarctica

8 (7 pts) *Fact #1:* The Earth was heavily bombarded 3.8 billion years ago.

Sample used:

9 (7 pts) *Fact #2:* The Solar system formed 4.5 billion years ago.

Sample used:

10 (7 pts) *Fact #3:* Some asteroids are very differentiated.

Sample used:

