

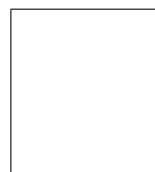
**Answer all questions in the space provided. If you have any questions, raise your hand.
100 points possible. No calculators.**

1 (5 pts) The gravitation force of the Sun on the Earth is about 176 times the gravitational force of the Moon on the Earth. However, the Moon has a greater influence on the tides on the Earth. Explain why this is.

The star HD 162020 has a planet 13.8 times Jupiter's mass orbiting it at a distance of 0.072 AU.

2 (5 pts) How does the **diameter** of this planet compare to Jupiter?

3 (6 pts) Explain why it would be difficult to detect this planet if it orbited 7 AU from the star.



4 (7 pts) We have learned that worlds in our solar system are basically composed of a mixture of Hydrogen, Helium, Ice (Water), Rocks, and Iron. For each of the solar system worlds listed below indicate what they are composed of. List the materials from most abundant to least abundant.

(Example) Earth: Rocks, Iron.

Mercury:

Mars:

Jupiter:

Callisto:

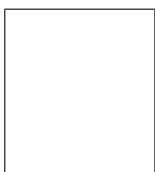
Saturn Ring Particles:

Neptune:

Cometary Nucleus:

5 (5 pts) On which of the worlds above would you expect to find the most primitive **solid** material? Explain your reasoning.

6 (4 pts) Explain how we know comets did **not** form in the inner parts of the solar system.



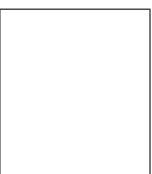
Trace the path of an **iron** meteorite from formation to hitting the Earth.

7 (2 pts) Where in the solar system did the parent body of this meteorite form? Please be specific.

8 (8 pts) Describe the appearance of the parent body and the location of the meteorite in the parent body (Feel free to make a sketch).

9 (4 pts) Describe how the meteorite got off of the parent body.

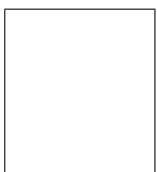
10 (6 pts) Describe how the meteorite got from the vicinity of the parent body to the Earth.



On the next two pages are four **False** statements. For each of these statements, explain what is wrong with the argument. Please be specific!

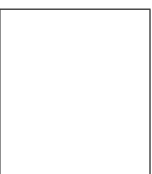
11 (8 pts) A single meteor entered the Earth's atmosphere and broke into 10 pieces. These 10 meteorites were collected on the ground. When the samples were examined in the lab it was determined that 8 of them were achondrites and 2 were carbonaceous chondrites.

12 (8 pts) The surface of Jupiter's moon Io has no impact craters indicating that it has never been hit by a meteorite.



13 (8 pts) The ring systems of Saturn, Uranus and Neptune extend out to a distance of about 2.5 planetary radii since, at farther distances, the planet's magnetic field is too weak to contain the ring particles.

14 (8 pts) The Earth's Moon is not being tidally heated because the Earth is much less massive than Jupiter.



15 (5 pts) Rocks brought back by the Apollo mission showed that the Moon had a magnetic field 3.3 billion years ago. What was different about the Moon 3.3 billion year ago that allowed it to have a magnetic field?

16 (8 pts) In the space below sketch and label the crater density plot of an old airless rocky world and an old airless icy world (airless = no atmosphere). Make sure to provide a range and label for the axes.

17 (3 pts) Which of the following lists best characterizes our solar system

- (a) Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, Pluto
- (b) Rocky inner planets, Gas Giants, Icy outer moons
- (c) Rocky inner planets, asteroids, Gas Giants, Icy outer moons
- (d) The Sun, asteroids, comets
- (e) The Sun, Jupiter

