Name _____

HOMEWORK #6 – Space Junk & the Gas Giants

Due Friday, June 2nd IN CLASS

Answers to the questions must be given in complete sentences (except where indicated), using correct grammar and spelling. Please be as brief and to-the-point as possible (*more is not necessarily better).*

You are encouraged to explore the web for help but **DO NOT COPY DIRECTLY FROM WEBSITES.**

Homework assignments must be legible. Handwritten or typed responses are permitted. Make sure that your assignment is stapled!

Grading Summary:

Question 1: 22 points

Question 2: 16 points

Question 3: 16 points

Question 4: 30 points

Question 5: 16 points

Total: 100 points

Note: For this assignment, please use your notes, the class textbook, and the website indicated in the directions as references to complete the questions. No additional online resources.

Name _____

1. The Tunguska Event

Tunguska, Russia: On the morning of June 20, 1908 witnesses described a brilliant fireball, brighter than the Sun, streak across the sky. Still descending, it exploded with a blinding flash & an intense pulse of heat. The blast was heard up to 1000 km away; the resulting pulse of air pressure circled Earth twice. For nearly a century, the source of the explosion has remained a great mystery. However, a group of Italian scientists have recently revisited the Siberian blast zone for clues of its origin. Read the following BBC-online news article and answer the questions below about the Tunguska Event: http://news.bbc.co.uk/1/hi/sci/tech/1628806.stm

The Tunguska blast caused thousands of kilometers of trees to burn and flatten.

1.1) While many people witnessed a fireball in the sky and hear the loud blast associated with an explosion, why has the Tunguska event remained such a mystery – in other words, what is missing from the impact site that would ordinarily provide scientists with clues of the impact source? Name two things:

1.

2.

1.2) Following a more modern study of the region, what kind of object do scientists now believe was the cause of the Tunguska Event?

1.3) Name two types of data (besides eyewitness accounts) that were used in this recent investigation of the Tunguska blast zone:

1.

2.

Name _____

2. Comet Crusade

2.1) What two types of tails do comets have as they near the Sun and how do they form?

1.

2.

2.2) Comets originate from two locations. List these locations. Also list the associated distances of these locations from the Sun (in AU).

1.

2.

3. Planetary Aurora & Magnetic Fields

3.1) What physical processes cause aurora?

3.2) Which planets produce observable aurora?

3.3) Why don't we see aurora on all of the planets?

Name _____

4. Mystery Planet

Suppose that a new planet is discovered with a mass of 5.24 x 10^{28}g and a radius of 1.28 x 10^{7}m.

4.1) What is this new planet's density (in g/cm^3)?

Hint #1: $Density = \frac{Mass}{Volume}$ Hint #2: The volume of a sphere = $\frac{4}{3}\pi R^3$

4.2) What is the bulk density of

Earth?

Mars?

Venus?

Mercury?

4.3) What is the bulk density of

Jupiter?

Saturn?

Uranus?

Neptune?

4.4) Would you consider this new planet to be a Gas Giant or a Terrestrial planet based on its density?

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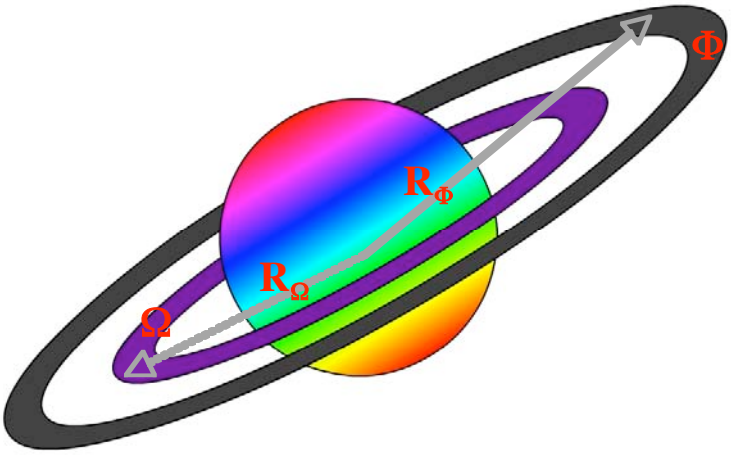
5. Rings n' Things

The following questions refer to the hypothetical gas giant planet Prometheus, shown below. Prometheus has two rings: **Ω** (inner) and **Φ** (outer), and four internal layers.

R_P = radius of Prometheus

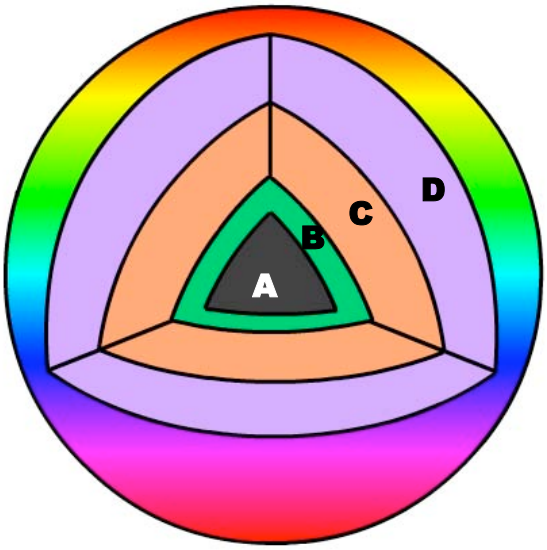
$R_\Omega = 1.2 \times R_P$

$R_\Phi = 3.4 \times R_P$



5.1) Based on your knowledge of gas giant planets, which of Prometheus' rings can exist: **Ω**, **Φ**, both, or neither? Give the reason for your answer.

5.2) Suppose that Planet Prometheus has four layers, shown below. Also suppose that Prometheus rotates half as fast as Earth and that it transports heat through convection. Based on this information, would you expect Prometheus to have a magnetic field? If so, where would it be generated and why?



A) Small rocky core

B) Ice layer

C) Liquid metallic H

D) Molecular H