

Answer all questions in the space provided. Please write in complete sentences. If you have any questions, raise your hand. 100 points possible.

1 (5 pts) There are at least a million asteroids in the asteroid belt. Explain why the Voyager spacecraft survived its trip through the asteroid belt undamaged.

2 (5 pts) Describe one piece of evidence that makes us think a 10 km asteroid hit the Earth 65 million years ago.

3 (6 pts) How does the gross composition of worlds inside the Asteroid belt (e.g. Mercury, Earth, ...) differ from worlds outside it (e.g. Europa, Ganymede, ...)?

4 (5 pts) What property of a gas makes it a good “greenhouse gas”? [don’t say “because it causes the greenhouse effect”]

5 (12 pts) Explain how the greenhouse effect works. Use Venus’ atmosphere as an example.

6 (6 pts) In class I said that Carbonaceous Chondrite meteorites are composed of “primitive” materials. Describe what is meant by “primitive” materials?

7 (10 pts) Explain how we know that not all of the asteroids in the asteroid belt are made of “primitive” materials.

8 (8 pts) List two similarities and two differences between the rings of Saturn and the rings of Uranus/Neptune.

9 (5 pts) Neptune's moon Triton probably does not have an internal heat source anymore and yet it has active volcanoes on its surface. Explain how this can be.

10 (6 pts) The Earth's Moon and Saturn's moon Titan are about the same size and have about the same gravity. Titan has a thick atmosphere while the Moon has none. Explain why the Moon does not have an atmosphere?

11 (12 pts) Io, Europa, and Enceladus are geologically active today due to tidal heating. Explain how tidal heating works.

12 (6 pts) Why is the Earth's Moon **not** geologically active today due to tidal heating by the Earth?

13 (6 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.

14 (8 pts) The comet Shoemaker-Levy 9 was broken into many pieces when it passed within the Roche limit of the planet Jupiter. What does this tell us about the structure/strength of the comet? [try to be more specific than just “strong” or “weak”]