

The Comet's Tale (key)

Name: _____

Astronomer's Review II

Origin of Comets

1. What is the Oort Cloud made of, and where is it?

In 1950 the Dutch astronomer Jan Van Oort proposed that the long period comets we see from Earth come from a huge 'cloud' of perhaps a trillion objects which exists far outside the orbits of the planets. Oort estimated the size of the spherical shaped cloud to be about 50,000 to 100,000 AU across (where 1 AU is the sun – earth distance), with our solar system in the approximate center.

The Oort Cloud consists of small icy and rocky bodies called planetesimals (a few km across). It is believed that the planetesimals formed when the solar nebula cooled early in the history of the solar system.

2. The Kuiper Belt and Oort Cloud both contain many comets. How is the Kuiper Belt different from the Oort Cloud? (Hint: think size and shape.)

The Kuiper Belt and Oort cloud are different in three primary ways: size, shape, and location.

The Kuiper Belt is a relatively small (about 100+ AU across) disk-shaped band of small objects (approximately 1 km across) which formed at the cold outer edge of the flattened planetary disk, beyond Uranus and Neptune. The Oort Cloud is a very large (50,000 to 100,000 AU in diameter) sphere-like "cloud" of small objects (planetesimals a few km across), which surrounds the rest of the solar system.

3. Are comets part of the solar system? What do comets have in common with planets?

Yes. All of the comets in the Kuiper Belt and Oort Cloud are part of the solar system. They orbit our Sun, and obey the same laws of motion as the planets and their moons. Comets also started with the same materials that planets like Earth were made from.

4. List how comets are similar to, and different from, the planets.

Comets and Planets are Similar because:

- both likely formed from the same beginning events and materials: (as the solar nebula spun, gases at the center collapsed to form the sun. The remaining cloud flattened into a rotating disk, and gravity caused denser areas of gas and dust to shrink and condense into small objects called planetesimals, about a kilometer in size. Some planetesimals collided

and stuck together eventually forming planets, while some individual planetesimals became comets)

- all planets and comets in the Kuiper Belt and Oort Cloud are part of the solar system
- they travel around our the sun
- they obey the same laws of motion and gravity

Comets and Planets are Different because:

- comets are small (few km)
- planets are large (a few thousand km across)

- comets are like “dirty snowballs” (composed mostly of frozen gases (ices), rocks, and dust)
- planets may be formed of gasses or solids, have outsides crusts with magma cores, etc

- comets cannot have moons
- planets can have moons

- planets have gone through evolutionary stages (for example, in the last 4.5 billion years Earth has been very hot, cold, had ice ages, and has developed soils, seas, weather, and life -- due in part to the fact Earth is relatively close to the sun and its energy, light, and heat)
- comets have not gone through the same evolutionary stages as planets (for the most part comets have existed frozen and far from the sun) and comets cannot have complex organic materials like dinosaur bones, worms, plants, etc